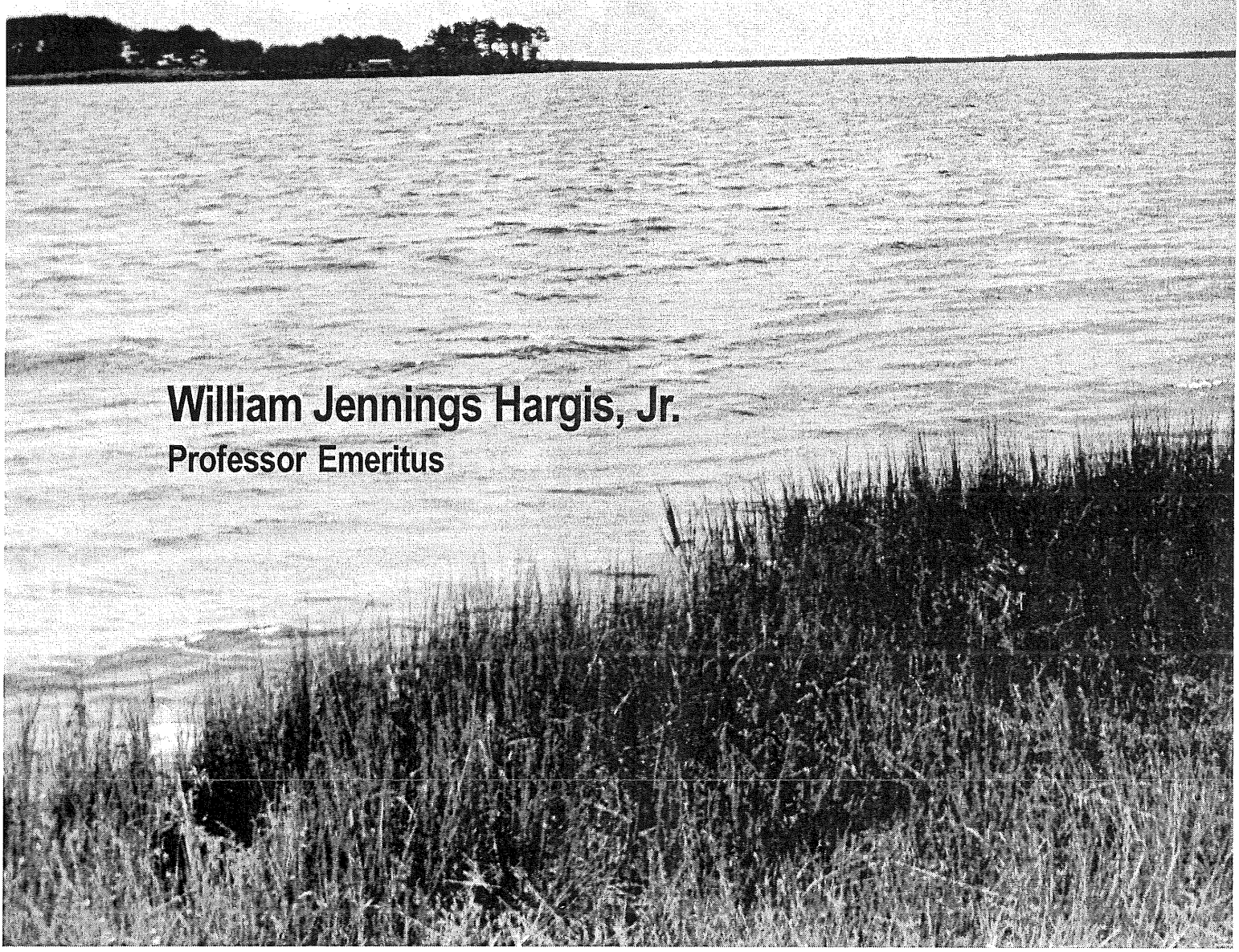
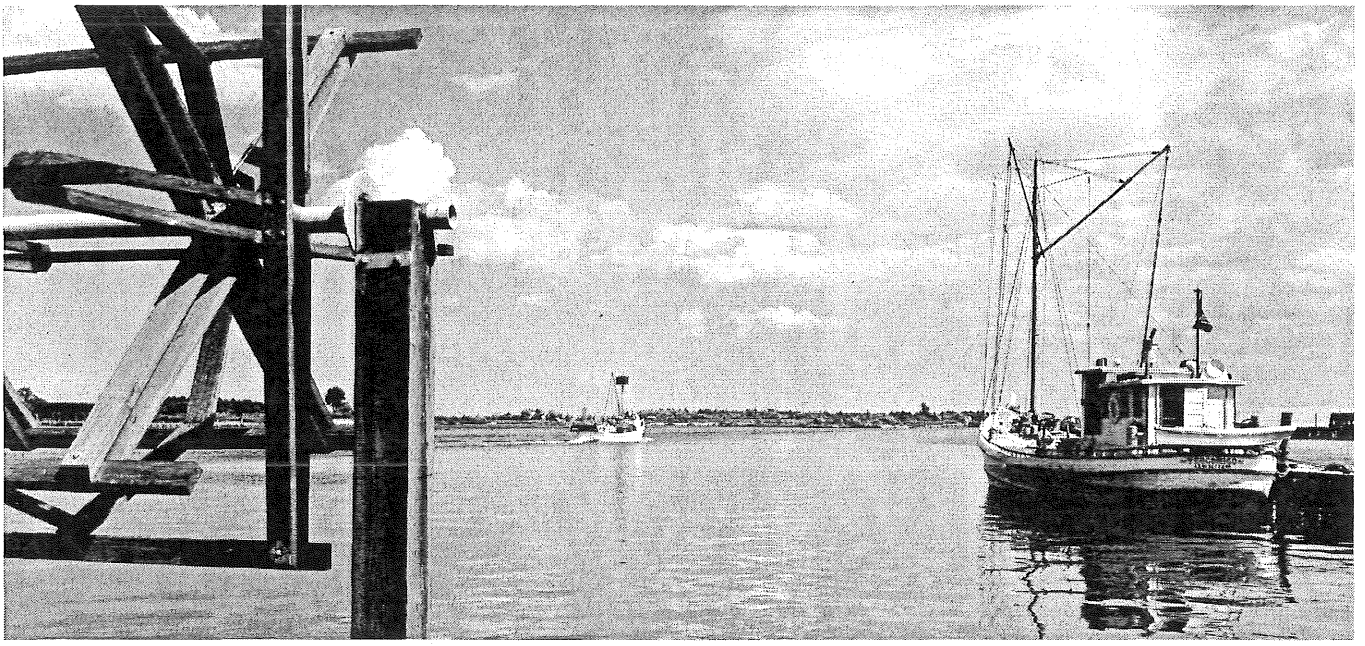
Research, Education and 'Proper Extension Work'

The First 50 Years of the Virginia Institute of Marine Science



William Jennings Hargis, Jr.
Professor Emeritus

Now in its second half-century of service to the people and posterity of the Commonwealth of Virginia, the Virginia Institute of Marine Science/the School of Marine Science of The College of William and Mary in Virginia is a remarkable oceanographic institution. Unusual in its melding of three essential public functions—advisory and consulting services, applied and fundamental research, and formal and informal education—the Institute is, to paraphrase Gilbert and Sullivan, "the very model of a modern" research, service and educational organization oriented toward resources and the environment. It is a veritable estuarine, coastal and oceanic fact factory, recognized as such by other groups interested in improved understanding and management of estuarine, coastal and marine resources and environments. It has been studied, and sometimes copied, regionally, nationally and internationally.



Research, Education and Advisory Services: An Overview of Accomplishments

As the General Assembly, via the Code of Virginia, formalizes an institution's authorization, it specifies general—and sometimes specific—areas of effort. Such legislative mandates are usually interpreted as the programmatic charges that a publicly chartered organization must fulfill. Since its beginnings the Virginia Institute of Marine Science has been oriented toward providing practical solutions to the problems of the maritime industries of Virginia. At first the seafood industry received priority, then environmental pollution, and over time the General Assembly has added many other commercial, social and economic responsibilities. Now all maritime segments are included. The program has been oriented toward service as successive General Assemblies have decreed: The Institute

The Virginia Institute of Marine Science is not only unusual, it is unique in its blend of activities: focused, interdisciplinary applied and fundamental research; individual research and scholarship; long-term surveys and monitoring of coastal resources and environments; public and collegiate education, especially at the graduate level; and provision of institutional advice and individual consultation—advisory services—to the citizens, businesses, industries and public managers of Virginia, the Chesapeake Bay region and the mid-Atlantic states. The Institute also has provided service nationally and internationally.

The Institute is unusual because it enjoys a strong level of financial support from the Commonwealth, realized via line items in the budget. It is unique among university-affiliated organizations because many of its official duties are prescribed by the Code of Virginia, as are many of the "clients" or "users" that it must serve. Authority for the Institute's accredited teaching programs is provided by the William and Mary Charter. Earlier, the Code also mandated that function. Finally, the Institute is unique in the public recognition that it has garnered during more than half a century of operation—especially during the past 25 years.

Administratively and budgetarily, the Institute began as part of the College and the Virginia Commission of Fisheries, first as the Marine Laboratory at Yorktown (1938) and then as the Virginia Fisheries Laboratory (1940). A separate direct appropriation was provided in 1944 when the Virginia Fisheries Laboratory was made a "permanent" state institution. The U.S. Bureau of Fisheries also helped support and administer the Laboratory's programs from 1938 to 1942, and possibly through 1944. The Laboratory was named the Virginia Institute of Marine Science and became an independent institution by Acts of Assembly in 1962. The Institute returned to the administrative control of the Board of Visitors of the College in 1979. Since then its line-item appropriations have been through the College's portion of the Appropriation Act.

The story of the Institute's beginnings as a cooperative venture by the College, the Virginia Commission of Fisheries and the U.S. Bureau of Fisheries, its developing organizational independence, and its growth and reunion with the College is interesting yet complicated. Embedded in its historical tapestry are threads of individual determination and indecision; grit and gutlessness; sprinting and plodding; initiatives seized and advantages lost; institutional, academic and political intrigue (plenty of all three); and successes and failures—fortunately, more of the former than latter. In short, the history of the Virginia Institute of Marine Science includes all of the elements usually involved in the lives of people and institutions.

Origins of American Marine Science

Like other biological systems, human organizations evolve—or die. The more dynamic and successful ones contain a surviving core that is stable yet capable of adapting to new conditions. A human organization rarely arises fully developed, is seldom created by one event. Instead, a series of events of varying significance are involved in its conception, gestation and growth.

For scientific organizations, the process is often initiated by a small group of people or even one person seeking patronage or support for the study of a scientific problem or phenomenon. Colleges, universities and businesses all have provided such support, but most has come from the government. Such investments of public funds are usually justified along practical lines: The public or its health and welfare will benefit from the investments. For marine science, that was the case in Europe as long ago as the Renaissance, and scientific developments in young America continued the trend.

In colonial times, the Virginia Company was granted the rights to the marine fisheries, including the sea beds, pearls, and other related resources: Company stockholders anticipated profits from them. That and the search for the much sought-after Northwest Passage to "Cathay" and the riches of the Orient prompted Capt. John Smith's exploration of the Chesapeake Bay. Further expeditions by Europeans and Americans were mounted to explore the coasts and their resources, to discover and exploit oceanic fish populations, to open areas for settlement and markets, to acquire more power, and, still, to search for short routes to the Far East.

The concepts of specialized schools, libraries and research institutes began early in human history, reaching their ancient zenith in the Alexandrian Library at Alexandria, Egypt, around 300 B.C. Modern marine-oriented investigative institutions, usually located by the sea and called "marine laboratories," may be traced to Europe.

In the United States, the first permanent marine laboratory was established at Woods Hole, Mass., around 1871 by Spencer Fullerton Baird, secretary of the Smithsonian Institution and the first U.S. commissioner of fisheries (appointed by President U.S. Grant). Marine scientist and historian Dr. Paul S. Galtsoff wrote in 1962, "During the first year of operations at Woods Hole, Baird and his associates laid down the foundation of a new branch of science which we now call fishery biology or fishery science." If Galtsoff meant marine fisheries science in the United States he is correct, but fisheries science actually had begun in Europe.

Academically affiliated marine laboratories began in the United States in 1873 when Louis Agassiz established the Anderson School of Natural History on Penikese Island in Buzzards Bay, Mass. His influence on embryonic marine science was significant, extended via example, salesmanship, and the work of his students. Not the least of his accomplishments was involving his mining-engineer son Alexander in his efforts. Their direct contributions to marine science began with Louis' arrival in the United States in 1846 and ended only with Alexander's death at age 75 in 1910. The period—totalling about 90 years between them—was a great one for the development of marine science in America, even though the Agassiz' two marine laboratories did not survive.

Budding Marine Science in the Chesapeake Bay Region

On the Chesapeake Bay, concern about the deteriorating condition of several fisheries prompted Maryland and Virginia to ask the federal government to help arrest and reverse the problems. Diminishing oyster harvests received attention first. The states' commissioners of fisheries, or their counterparts of the time, soon became involved. In Maryland Dr. William Keith Brooks of The Johns Hopkins University began studying the oyster and became involved in management efforts as a member of Maryland's fisheries commission. Among other contributions to knowledge of the Chesapeake, Brooks established and directed the Chesapeake Zoological Institute in 1877 or 1878 and later published a popular monograph on the oyster. Although the institute (which operated at Fort

continues to have clear legislative mandates.

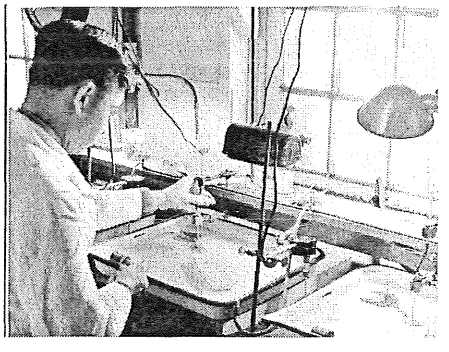
Such legislative mandates outrank any plans developed within the organization and must be the basis for internal planning, the foundation on which capital and operational programs are built. They also should provide the yardstick against which accomplishments are judged for each chartered program area.

VIMS has three areas of assigned responsibility:

- **Research—applied research and focused fundamental research—on the resources and environment of the tidal waters of the Commonwealth, the contiguous waters of the Atlantic Ocean, and relevant phenomena in marine science;**
- **Provision of useful information to public and private managers and users of those environments and resources; and**
- **Formal and informal educational programs regarding the marine sciences, arts and engineering, and the resources and environments of the Chesapeake Bay, the Atlantic, and elsewhere in the world ocean.**

For the Virginia Institute of Marine Science, the essential questions are, what has the first half-century yielded judged against the legislated mandates and the expectations of the major players? And, what has the Institute contributed to the health, welfare and quality of life of the people of Virginia and to their posterity?

A researcher drops carmine stain into the water current of an oyster at the U.S. Bureau of Fisheries' Yorktown laboratory (1930s).



Research

By the 1920s the marine resources of the tidal waters of the Chesapeake Bay and adjacent coastal sea were perceived to be under increasing pressure, as they were. Management efforts were suspected of being largely ineffectual, as they were. Maryland became concerned before Virginia, probably because more of Maryland's land, counties, cities and towns border the waters of the Bay and the ocean. Maryland's principal city, Baltimore, and its capital, Annapolis, are on the Chesapeake, and the state's Chesapeake waters are more confined than those of Virginia. In Virginia the Bay is wider and of greater volume, joining the Atlantic at the 16-mile-wide Bay mouth where it receives a constant massive injection of cleaner ocean water.

In the late 1800s Dr. William Keith Brooks of Johns Hopkins, who established the Bay's first marine research laboratory (the Chesapeake Zoological Institute), expressed strong concerns over uncontrolled oyster catches, predicted diminishing harvests, and provided preventive prescriptions. His practical remedies—as applicable today as when they were first publicized in 1891—were largely ignored.

At both ends of the Chesapeake worries increased about a number of phenomena: severely depressed shad runs and catches; wide fluctuations in numbers of other fish species; winter

Dr. Donald W. Davis.

Wool in Hampton Roads one year and at Hampton Institute another) did not survive Brooks, it was the forerunner of permanent Chesapeake Bay research institutions, such as the Chesapeake Biological Laboratory and VIMS. Also in the late 1800s the U.S. Coast Survey sent Lt. Francis Winslow to study oysters in Pocomoke Sound and Lt. J.B. Baylor to survey Virginia's oyster beds.

Fisheries problems would dominate the interests of industry and marine science for two decades, to be joined in the early 1900s by pollution. Even as interest developed in pollution, elements of the fisheries were involved. East Coast epidemics of typhoid fever and gastroenteritis in 1894, 1902 and 1904 were attributed to consumption of raw shellfish. Probably as a response to public health concerns, Congress passed an Act Aug. 14, 1912, providing for "investigations of the pollution of navigable waters."

After requests by authorities in Maryland, Virginia and the District of Columbia, the U.S. Public Health Service began a study of the Potomac River and its watershed. The program was expanded in 1914 to assess the pollution of tidal waters and its effects on the public health. The studies included surveys of watersheds and laboratory examination of water, mud and shellfish—especially those from tidal waters that provided shellfish and other sea products for food. As a result of those studies, fishing was restricted in a number of shellfish beds in the lower James River and near several settled areas on the York, Rappahannock and Potomac rivers.

In other states, typhoid fever and gastroenteritis outbreaks—some traced to oysters—caused a nationwide decline in the oyster market, prompting industry representatives and governments on the Chesapeake to increase their public health efforts and to seek additional help from Washington. The Virginia Department of Health acquired laboratory vessels for work in the lower Bay, and the Public Health Service established a laboratory at Craney Island in Hampton Roads.

By the late 1920s, eelgrass was disappearing from many Atlantic coastal waters, and severe oyster mortalities threatened the fishery in the lower Bay. The problems heightened the concern of industry, government and scientists, and pressure mounted for more scientific study.

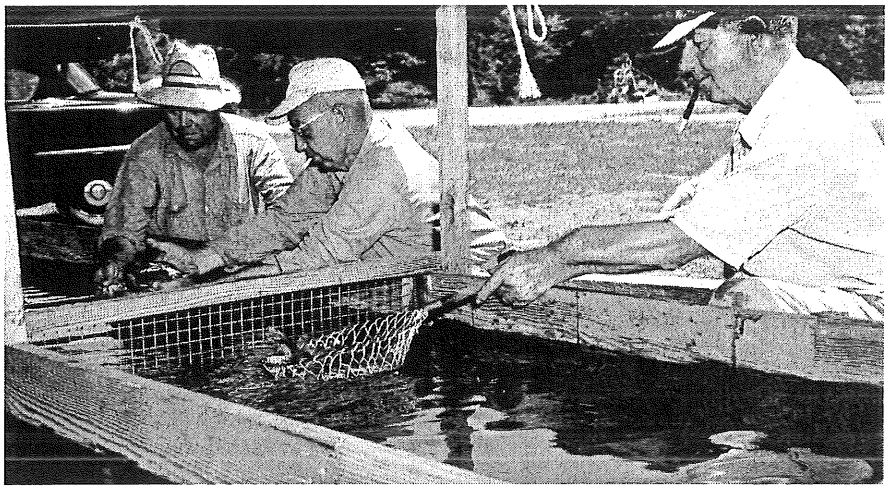
Virginia's First Champion of Marine Science

The Agassiz tradition undoubtedly had its influence on the development of marine science in Virginia, specifically via two scientists, Marylander Reginald Van Trump Truitt and Pennsylvanian Donald Walton Davis, who had worked with the successors of the Agassiz. Davis earned both bachelor's and Ph.D. degrees from Harvard University, where Louis and Alexander Agassiz had worked. Truitt developed the Chesapeake Biological Laboratory at Solomon's Island, Md., and urged Virginia to follow suit.

Dr. Donald W. Davis was the most determined and persistent of the early promoters of marine science in Virginia. A member of the College's biology faculty from 1916 to 1950, Davis had become interested in marine science by at least 1925. That year, he wrote Richard Armstrong, a Hampton seafood planter, packer and dealer (who would later become the state's commissioner of fisheries), to arrange a meeting to discuss "the possibility of cooperation between the State Seafood Growers and Dealers and the College of William and Mary." In his response, Armstrong wrote of his interest in "a plan that would assure permanent and non-political interest in the development of our sea foods."

From such early interactions with interested protagonists, Davis formulated the concepts of interaction between the College and the seafood industries, concepts that in 1930 he presented to the National Shellfisheries Association. The essentials of his presentation were published in *Science* (Vol. LXVII, No. 1869, pages 413-416) in an article titled, "How the College Can Aid the Oyster Industries."

His ideas included hiring a university-trained biologist to conduct original research on the oyster and its environment; to adapt the results of fundamental research to local situations (Davis wrote, "A few bushels of experimental demon-



Virginia watermen tend blue crab shedding trays.

strations may save boatloads of losses."); and to routinely test conditions in oyster-producing areas. Davis foresaw that all three types of studies would lead to studies of other types.

In recommending a university setting for such studies, he emphasized the availability of student assistants and of the expertise of other departments' faculty members. He also indicated that universities could supply technologists to improve industry practices and help solve problems. Finally, he urged colleges to train students interested in the seafood industries as marine biologists, technologists and administrators to "make another generation of real oystermen."

Davis' correspondence indicates that 1930 was a year of intense activity for him, demonstrating not only his great interest in developing a marine laboratory in Virginia but also his resourcefulness, resiliency and flexibility in promoting that objective. His concepts had changed somewhat, as indicated by legislation he drafted to establish a marine biological laboratory at the College. While developing his new ideas, Davis outlined his thoughts on "Virginia Oyster Problems" and wrote a five-page "Memorandum on Seafood Investigations." In his memorandum, he recommended studies in several seafood-producing areas, balancing geographic coverage. The studies would be conducted by satellite technical staffs of partially trained, locally based scientific assistants and local part-time workers, who would report their data to a "fully trained" marine biologist at a central marine laboratory. The biologist would analyze the data, develop and test remedial methods, and communicate the results to industry, again via the satellite network. The satellite staffs would then demonstrate "on the grounds" the effectiveness of the methods the scientist had tested.

They also would educate the public as to the "importance of the regulations made for the conservation and development of the industry." The resulting informed public opinion would make "enforcement activities more effective and enable oystermen to improve methods of production in ways that cannot be affected by repletion." Therefore, Davis wrote, "the work of the local staffs should become increasingly educational," that "it is proper extension work," and that it should be done under the auspices of an educational institution after the model of the agricultural experiment and extension programs.

According to Davis, because of how the commissioners of fisheries had to make and enforce regulations, they were forced to "neglect their responsibilities for (doing) scientific investigation and development." So Davis pointedly recommended that the much-needed scientific and educational program be separated from the regulatory one: "These contrasting functions being highly divergent in type and method it is appropriate that the formal investigational and educational function be separated from the regulatory duties of the Commissioner of Fisheries and assigned to the College of William and Mary." In his memorandum he identified his argument for doing so with the subtitle "Separation of Investigational, Regulatory and Enforcement Functions."

crab dredging; the taking of egg-bearing, or "sponge," crabs; predictions of failing oyster production; and industrial pollution. Experts in Maryland were especially concerned about Virginia's apparent lack of regard for the blue crab by allowing the crabbers to keep sponge crabs and to dredge "hibernating" crabs to maintain production in winter.

For both states the severe nationwide decrease in the demand for oysters occasioned by the shellfish-related typhoid outbreak in the 1920s heightened concern over the pollution of tidal waters, once believed invulnerable. Widespread mortalities of eelgrass beds and oysters in the late '20s increased official and public fears over the welfare of the seafood industry and the marine environment.

The public increasingly perceived science as able to explain and solve medical and environmental mysteries and was more receptive to the investing of public funds in research of all types. Maryland's public officials decided to support marine research around 1919. The Bay's first permanent marine laboratory, the Chesapeake Biological Laboratory, was established at Solomon's Island, Md., in the '20s. The Virginia Fisheries Laboratory was established in 1940 and was made a permanent, state-supported organization in 1944, at the height of World War II when many other problems, including national survival, assailed the public mind.

Since the Institute was founded, problems have arisen or been assigned that have required rapid response. Its ability to focus quickly on a topic has been vital to its meeting the maritime-related needs of the Commonwealth and its corporate and individual citizens. Indeed, it has been the power of the Institute's organization and

operating format that has set it apart from other types of research institutions in working on complex resource and environmental problems.

Problems have arisen in all disciplines, from economic, legal and social studies to biological, chemical, geological and physical oceanography. Research in estuarine and marine fisheries science has made up a significant portion of the overall research effort. Other topics include modelling of biological processes, ecosystems, and chemical, geological and physical processes. Model types have included mathematical, physical-scale and computer-graphics models. Remote sensing, via stationary and floating recording instrument arrays, airborne sensors, and satellites, has been a focus at VIMS since the beginning of the national remote-sensing effort.

Most major fisheries and environmental problems are of such broad scope and complexity that only integrated groups of specialists can approach them with any chance of success.

Interdisciplinary attention has been devoted to research on the circulation, chemistry and biology of the lower James River estuary and into important oyster seed beds; the effects of nutrients and toxicants; possible effects of the operation of the Surry and North Anna nuclear power plants and similar facilities in Virginia and Maryland; circulation of the Chesapeake Bay and its tributaries; Bay-Atlantic interactions; the effects of extreme events, such as hurricanes Camille and Agnes; and impacts of the construction of artificial islands.

The greatest shortcoming of the research program is not unique to the Institute: sporadic attention to securing and maintaining long time-series of environmental and resource data. Availability of funds and changing interests and research emphases have created gaps and dissimilarities in collections of quantitative data on various species important to the fisheries and on physical processes. For whatever reason, scientists often lose interest in or lack the time for

In 1930 Davis also drafted an amendment to Senate Bill 121 that would have provided that "The College of William and Mary shall establish a laboratory for the study and experimentation with oysters and other seafoods with a view to conserving and increasing such oysters and other seafood" and would have appropriated monies to the College for the new institution. The draft amendment included a number of other specific provisions, but establishing a practically oriented marine laboratory was Davis' essential objective. His draft of a companion bill, House Bill 110, was worded similarly. Neither bill passed as he envisioned and drafted them.

Virginia's First Trained, State-Supported Marine Scientist

The General Assembly showed support for Davis' bills, but it waffled as to where to place the marine laboratory administratively and left the decision to Gov. John Garland Pollard.

The bill that did pass (Chapter 321, Acts of Assembly, 1930) directed the commissioner of fisheries and the health commissioner to "prepare, recommend and present to the Governor a plan for the establishment of a laboratory for the study of, and experimentation with, oysters and other sea foods of Virginia, and the employment of a biologist, in order to effectually develop and conserve the seafood industry." The health commissioner was prominently involved because the pollution and public health scares of the '20s had prompted the General Assembly to place management of oyster production in his hands.

The commissioners did not follow the Assembly's directive entirely, saying that they could not recommend the immediate establishment of a laboratory because its exact needs "could not well be forecast and must await the advice of the biologist to be employed." They indicated that any resulting delay would be insignificant, because the College and the U.S. Bureau of Fisheries, which was conducting shellfish investigations in Virginia, would make their facilities available to the biologist the commissioners recommended. They sought Gov. Pollard's permission to direct monies from the Oyster Repletion Fund to pay the salary and associated expenses of a marine biologist to be employed by the Commission of Fisheries.

The commissioners recommended for the post biologist Victor L. Loosanoff, who was working for the health department of Washington state on biology and pollution related to fish life. Gov. Pollard approved the recommendations, and in mid-January 1931, Health Commissioner Williams offered Loosanoff employment beginning March 1 at a salary of $3,000 per year, plus moving costs.

Materials in Davis' files indicate (although in a manner muted and tempered by what must have been heroic attempts to be reasonable and "cool") that a sharp battle preceded passage of the bill. Lines were drawn between state agency officials and perhaps a segment of the seafood industry on one side, and the scientists or academicians, represented by Davis and another segment of the industry, on the other. Each side used every tactical trick in the book to achieve its objectives while not sacrificing—fortunately—the strategic goal of a marine science program for Virginia.

Armstrong, of Hampton's seafood industry, had indicated to Davis that the scientific research and advisory program had to be objective and free of politics to be effective. Following Armstrong's advice and undoubtedly his own instincts, Davis said clearly and forcefully that the state's executive management agencies were controlled by the vagaries of pressure and politics and that management of a scientific research and advisory program must be entrusted to a more objective and balanced organization—the College.

This cogent argument did not prevail at first. Instead, the short-term victory went to Commissioner of Fisheries Chinn and his supporters. In the end, however, circumstances, determination and a long tenure of office tilted the scale toward Davis and the College and their supporters.

While lobbying for his legislation Davis had petitioned the governor and General Assembly, pressured the commissioners of health and fisheries, worked with the U.S. Bureau of Fisheries, communicated widely, gathered information

and recruited support for the cause. When his version of the bill failed, Davis "respectfully" continued his efforts, mustered additional facts, and maintained pressure while establishing and maintaining a presence for the College and himself. He was a determined and persistent shepherd of the cause.

He reaffirmed the College's interest in the project and indicated that a place would be found for Loosanoff "should Judge Chinn decide that Mr. Loosanoff should establish provisional headquarters in Williamsburg." Loosanoff was quartered in the ferry terminal building near the Chamberlin Hotel at Old Point Comfort in Hampton in what had been a men's restroom. He said that for a time his work was frequently interrupted by men seeking "the facilities." He also said that equipment was scarce and that it took considerable effort to arrange through the Commission to acquire a microscope for his work. He felt that most of the commissioners expected him to work like a Sherlock Holmes, with a magnifying glass and meerschaum pipe, poking around, looking wise, and making astounding discoveries. Unfortunately, this extremely competent marine scientist, destined to be a productive researcher, accepted a position with the federal government in December 1931, less than a year after his employment as Virginia's first marine biologist.

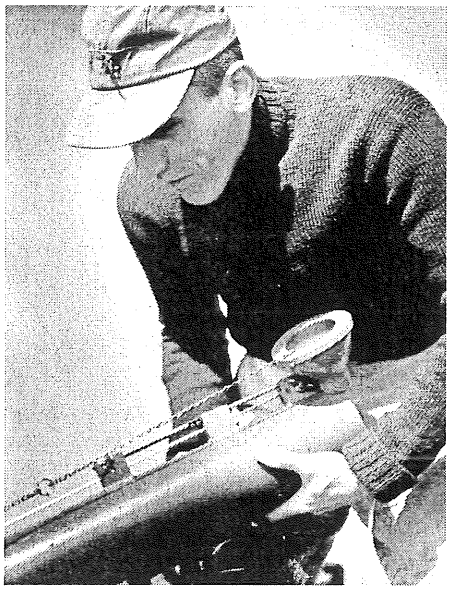
Loosanoff 's departure enabled Davis to renew his efforts to secure permission to establish a marine laboratory at the College and get underway the program he had proposed. To fund the laboratory, he recommended using monies already appropriated to the Commission of Fisheries and the College. Citing the critical "State of the oyster industry, its continuing depletion, the prospects for effective results of a biological study of the oyster areas," he urged that "crucial experiments and demonstrations" be organized by May 1, 1932, lest they be postponed another year. Davis urged proceeding with the work at "the earliest practicable time under authority of Section 3148 of the Code of Virginia" (provided that it had "not been repealed") "or under other existing provisions of law."

His attempts to establish the marine laboratory at and under the control of the College apparently were strengthened by several proponents, including even the Commission of Fisheries. In January 1932 Armstrong, by then fisheries commissioner, contacted William and Mary President J.A.C. Chandler regarding the possibility of establishing "the Biologist for the Fish Commission" at the College.

The Federal Government to the Rescue

As Virginia debated where to situate its marine laboratory, problems in the oyster industry prompted federal action. Strong pleas for help from industry and public seafood officials had resulted from the typhoid scare of the mid-1920s, which caused the demand for oysters to plummet nationwide. Those pleas, along with the massive oyster mortalities of the late '20s and their alleged link with pollution, brought the U.S. Bureau of Fisheries to the lower Chesapeake. With urging from Gov. Pollard and his commissioners of fisheries and health, Henry O'Malley, commissioner of the U.S. Bureau of Fisheries, was persuaded to join the Commonwealth in the much sought-after seafood investigations.

The joint effort began around 1930 largely as field research, with federal scientists using the Commonwealth's dredge boats, skiffs, field equipment and facilities. In 1930 or 1931 the U.S. Bureau of Fisheries established a laboratory at Yorktown. On staff there from 1935 to 1937 before completing his doctoral dissertation was Arthur D. Hasler, who would become instrumental in the development of the oceanography and limnology program at the University of Wisconsin and a director of the university's limnology laboratory. He is still active in those programs as a professor emeritus. Close cooperation developed between the federal program, William and Mary, and the Virginia Commission of Fisheries, interaction that led eventually to a period (from 1938 to 1942 or 1944) of joint funding and participation in the Yorktown program by all three groups. Cooperation with federal agencies persists. In fact, the U.S. Fish and Wildlife Service and the National Marine Fisheries Service have provided financial support for the Institute during most of its half-century, and several times their personnel have been based at the Virginia Fisheries Laboratory.



Researcher Ernie Warinner prepares to take a water sample using a van Dorn bottle (1950s).

routine collection of data, concentrating on studies that can be completed and the results published in relatively short order. But many marine phenomena are of such a variable and cyclic nature that they require data recorded over long periods of time, in a manner that will allow their compilation and valid analysis. Without data in that form, it is all but impossible to recognize and characterize many environmental perturbations and their causes. With modern technology, however, data gathering and use can reach new heights, to the benefit of resource and environmental research and management.

In summary, much remains to be learned about the biological, chemical, geological, physical processes of the Chesapeake Bay and its tributaries and the coastal and continental shelf waters of the Atlantic. Many details of the economic, social and legal aspects of Virginia's marine resources and environments and its uses and users are not well understood. Yet there can be no question that the mandate to conduct applied and focused fundamental research has been largely met. Without the knowledge developed by the professionals of the Virginia Institute of Marine Science and its predecessors, society's fund of information on the tidal waters of Virginia would be sparse indeed.

The Virginia Fisheries Laboratory

The official beginnings of the Virginia Fisheries Laboratory as a state-established, primarily state-supported scientific organization can be traced to the 1938 Acts of Assembly budget enactment, which provided $5,000 to the 1939-40 biennial budget of the Virginia Commission of Fisheries for the operation of "the laboratory at Yorktown." The appropriation was to come from the General Fund, unlike the rest of the Commission's budget, which came from revenues generated by the Commission itself. The General Assembly further stipulated that it would make available the $5,000 only if another $7,000 was "made available for the operation of the said laboratory by the Federal government." Encouraged by Commissioner of Fisheries G. Walter Mapp (also rector of the College's Board of Visitors), the Virginia Fisheries Laboratory officially opened its doors at Yorktown on July 6, 1940, funded by both the federal government and the Commonwealth (the College and the Commission).

Funding via William and Mary for the 1941-42 biennium totalled $5,000 "for equipment for the Marine Biological Laboratory." Chapter 114 of Acts of Assembly 1944, Paragraph 1, Section 1 (S. 130), implies that the College also contributed operational support, with expenditures for space and salaries. The Assembly authorized a General Fund appropriation for 1941-42 of $10,000 and for 1943-44 of $11,000 through the Commission of Fisheries.

The Laboratory was not a permanent agency or institution of the Commonwealth, nor was it officially named the Virginia Fisheries Laboratory, until 1944 with the passage of Senate Bill 130, sponsored by Sen. Marvin W. Minter of Mathews and Del. Paul Crockett of Yorktown. Chapter 114 of the Acts of Assembly is characterized specifically as "An Act to continue the Marine laboratory under the name of Virginia Fisheries Laboratory and provide for its operation, to provide for the appointment of an advisory group in connection with such laboratory, and to prescribe the duties and functions of the group when appointed." The bill realized Davis' 20-year dream of a state-supported marine laboratory for Virginia.

The Act established a five-member Board of Administration for the Laboratory: from the College, the president and the head of the department of biology; from the Commission of Fisheries, the commissioner and an associate commissioner appointed by him; and an ex officio member, the Laboratory director, who also served as secretary. The Act also established a 10-person Advisory Group, to be appointed by the College president and the commissioner, to help select and initiate research and service projects. The Advisory Group was to represent as equitably as possible Virginia's various seafood-producing areas and diverse seafood industry.

The responsibility for recruiting a director for the new Laboratory passed to Davis, who, as acting director, had been in charge of the College's portion of the marine laboratory's activities since 1938. An advertised search for an experienced marine scientist brought contact with a number of people from institutions across the United States. One of them, Dr. Curtis L. Newcombe, a naturalized U.S. citizen from Nova Scotia working at the University of Maryland's Chesapeake Biological Laboratory, became director July 1, 1940.

Newcombe, a marine ecologist who had worked at marine laboratories on Puget Sound and in New Brunswick, Canada, immediately began work on an operations plan for the Laboratory. Offices and experimental facilities were located at the William and Mary campus, and the principal field laboratory continued in its Yorktown quarters.

At a branch facility on the Eastern Shore at Wachapreague, research was conducted on local mussels for the E.I. du Pont de Nemours Co.'s vitamin D development operation (World War II had disrupted the international chemical trade, severely reducing the commercial availability of vitamin D.) and on oysters and hard clams. Other field operations were conducted at Seaford and Fox Hill on the western shore and at Kings Creek, Elkin Island and Chincoteague on the Eastern Shore. The research covered a broad geographic area, as Davis had urged.

Newcombe and Davis, with a professional administrative and student staff of varying size, were able to maintain research, advisory and educational programs throughout the war period (1941-1946)—no small feat for such difficult times. However, no noteworthy additions were made to property holdings, and the Eastern Shore field laboratory at Wachapreague was a casualty of the period.

Research accomplishments for that and any period of the Virginia Fisheries Laboratory are described in the Laboratory's annual reports to the commissioner of fisheries and the College's Board of Visitors (later the reports would be addressed directly to the governor). Principal attention was given to culture of mussels (supported by Du Pont) and oysters; culture of hard and soft clams under natural conditions; the oyster drill and possible control methods; the blue crab; tagging studies of shad (with the U.S. Bureau of Fisheries); biology of striped bass and catfish; and the physical and chemical conditions of local waters (supported by the American Philosophical Society). Nutrients, toxicants (pulp mill wastes) and low-oxygen episodes were subjects of research even then!

Education

Collegiate and Graduate Studies. Donald Davis' vision of a graduate program in marine science required some time to develop. Around 1940, about 10 years after he began his campaign for a state-supported marine research program, the first master's students in the field at The College of William and Mary began their studies.

In the beginning the formal educational program was carried out as part of the College's department of biology—not a surprise, because Davis was its chairman. The degree offered was the master of arts in aquatic science. Before development of this specialized program, Davis introduced many of the College's neophyte biologists to marine science. It is not known how many undergraduates Davis thus persuaded to become marine scientists, but at least one William and Mary alumnus, A.F. Chestnut '41, did graduate work in marine science at Rutgers University and later became director of the University of North Carolina's marine laboratory at Morehead City.

In 1943 the first master of arts degree in aquatic biology was awarded to R. Winston Menzel, who later attained the Ph.D. degree and remained in the field until his recent death. At Florida State University, Menzel served as the major professor of Dr. Frank O. Perkins, the present director of VIMS. Mary Rogers Talbert received her master's degree in 1945, the first woman to do so.

During the 1940s few students (in some years, none) enrolled or graduated. The tide of formal education in marine science in Virginia rose ever so slowly in those

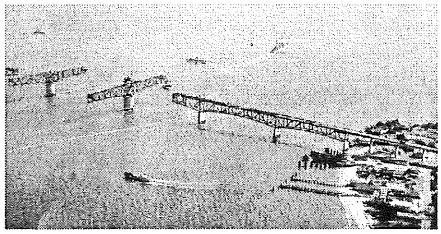
early years. There were two primary causes. National, regional and state concerns, resources, and young people were diverted to meet the demands of worldwide warfare. Also, the program was young and small. The wonder is not that the educational program developed slowly but that it survived this difficult period.

During his tenure as director of the Virginia Fisheries Laboratory, Dr. Curtis L. Newcombe tried unsuccessfully to separate the marine science curriculum from that of the biology department. Until 1959 the graduate effort remained in the biology department, and even when graduate students researched estuarine or marine problems, they received their master's degrees in aquatic science.

In 1959 the department of marine science was established and the degree offered became the master of arts in marine science. The College requested permission from the State Council of Higher Education in Virginia to offer the Ph.D. degree in marine science. The Council countered with a plan for a cooperative doctoral program involving William and Mary, the University of Virginia, Virginia Polytechnic Institute and the Medical College of Virginia. Degree offerings were confined to the master's level until 1963 when the Council authorized a Ph.D. in biological oceanography and fisheries biology at VIMS for the University of Virginia's new department of marine science and for William and Mary's School of Marine Science. The first Ph.D. degrees were awarded from VIMS in 1968.

William and Mary received the Council's recognition as a university in 1968 and by 1975 had persuaded the University of Virginia to terminate its graduate programs in marine science. Theoretically that would have left graduate education in marine science in Virginia to William and Mary's School of Marine Science, provided essentially by VIMS, and to Old Dominion University. However, the University of Virginia had established a new department of

The George P. Coleman Bridge, 1952.



Work was carried out in close cooperation with the Commission of Fisheries, and attention was given to the Commission's interests and to those of industry. Much of the mollusk work was done in cooperation with seafood interests in several of the state's seafood-producing regions, including the Eastern Shore.

The Laboratory's advisory program was vital. Newcombe was keenly attuned to the needs of industry and frequently responded to industry calls for assistance, according to Dr. Alfred R. Armstrong sometimes to the chagrin of his scientists, whose ongoing research projects were interrupted. Armstrong, now a professor emeritus of chemistry at the College, worked at the Laboratory in its early days and with the U.S. Bureau of Fisheries before the state Laboratory officially opened.

The education programs, which began at the College before the Laboratory was organized, involved undergraduate and graduate education in aquatic biology. Formal courses, offered year-round, provided credits in aquatic biology and could lead to the master of arts degree. More teachers were hired in summer to provide special courses, and several graduate students enrolled.

The Laboratory's research and instruction programs were also aimed at high school students, and a biologist was hired to head that effort. During the early years, arrangements between the Laboratory and the education administrations of nearby counties provided direct services to public schools. The patterns of interaction thus established have persisted in various forms and with considerable mutual benefit throughout the history of the Institute.

In late 1942 Newcombe wished to reorganize the laboratory and to make it a separate department of the College, a move that Davis thwarted the following year. Other disputes occurred, some internal, some external (such as a continuing struggle with Chesapeake Biological Laboratory Director Truitt over authorship rights), and after a period of increasingly heated debate Newcombe resigned his position in November 1946.

Davis was appointed secretary of the board in Newcombe's place. Asked to recruit Newcombe's replacement, Davis also was assigned the task of supervising the program until a director was found, becoming acting director a second time. After another wide-ranging search, Dr. Nelson Marshall, a native of New York state, was appointed director in 1947. Most of the original professional staff members had left the Laboratory, and a new group of three aquatic biologists had been employed, one of whom served as an extension scientist. Two of them, Dr. Jay D. Andrews and Willard A. Van Engel, are still active at the Institute today as professors emeritus in marine science.

Construction of the George P. Coleman Bridge to replace the ferry between Yorktown and Gloucester Point required the Laboratory's land at Yorktown, and new land was acquired for a permanent laboratory building at Gloucester Point. Marshall presided over the design and construction of that building, now named Maury Hall after Virginia's first and greatest physical oceanographer Matthew Fontaine Maury. Dedicated in October 1950 along with a maintenance building, the 6,400-square-foot building housed all offices and laboratories, a library, men's and women's dormitories, and a public exhibit area.

Virginia's and Maryland's Chesapeake Bay Institute

Separately, Virginia's and Maryland's marine research efforts were inadequate to explain the complicated chemical, geological and physical phenomena of the Chesapeake Bay. With the Office of Naval Research, the Virginia Fisheries Laboratory and the Chesapeake Biological Laboratory planned to establish a new laboratory at Johns Hopkins, the Chesapeake Bay Institute.

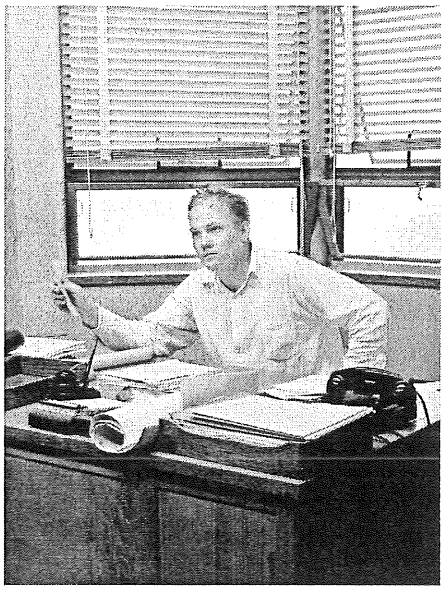
Authorization and funding were sought, and in 1948 Virginia House Bill 544 authorized and directed the Virginia Fisheries Laboratory "to conduct a hydrographic and biological study of the Chesapeake Bay and the tributaries thereof and all the tidal waters of the Commonwealth of Virginia." The Laboratory also was authorized to cooperate with similar state and federal agencies in the study and was appropriated $30,000 a year for the 1951-52 biennium in support of the program. The funds were transferred to Johns

Hopkins for maintenance and operation of the Chesapeake Bay Institute, which conducted Baywide hydrographic investigations. Comparable funding was provided by the state of Maryland and by ONR, which later boosted its share.

CBI's annual reports for 1949 and 1950 list its affiliations ("sponsored by the Virginia Fisheries Laboratory, Maryland Department of Research and Education, Office of Naval Research, and Johns Hopkins University") and the members of its staff and advisory committee. During those early days CBI was managed by an executive committee consisting of Marshall, Truitt (by then director of the Maryland Department of Research and Education as well as of the Chesapeake Biological Laboratory), and Donald W. Pritchard, the CBI's new "associate director." The staff included three physical oceanographers, a research chemist, two chemical technicians and an electronics engineer.

As CBI was being established, the staffs of the Chesapeake Biological Laboratory and the Virginia Fisheries Laboratory were being augmented. With added research and technical capability, research on the Chesapeake Bay gained breadth of discipline and momentum. Interinstitutional and interdisciplinary studies increased, especially between CBI and its supporting scientific organizations.

CBI began to provide Virginia Fisheries Laboratory students and scientists special study in physical and chemical oceanography and diving. In return, VFL personnel provided courses in biological oceanography and fisheries biology for CBI students. That interchange continued into the early 1960s when VIMS undertook its own programs in those subjects. By then CBI had begun its own biological research and education programs.



Dr. Nelson Marshall, second director, 1947-1950.

The Post-War Laboratory

Soon after Marshall became Laboratory director he began to hire more scientists. When the responsibility for fiscal control passed from the Commission of Fisheries to the Laboratory, an administrative assistant and several clerks were added to the roster. Marshall, with the approval of the board, attempted to have the Laboratory's scientific staff exempted from the provisions of the State Personnel Act, like professional faculty of state-supported colleges and universities. That would have removed the scientific staff members from the restrictions of the state's classified employee system and allowed greater salary flexibility. The state Personnel Office did not allow the change but did study scientist positions and clarify job descriptions and salary scales. The position roster included the classifications Aquatic Biologist A, B and C; Aquatic Biology Extension Agent; and Fisheries Laboratory Director. In addition to the classified job titles, it allowed a separate title corresponding to the Laboratory's organizational scheme.

Around 1948 Marshall was appointed dean of faculty at the College. Amid administrative turmoil stemming from difficulties within William and Mary's athletic programs, Marshall resigned the Laboratory directorship in late 1950 but agreed to remain as acting director until his successor was appointed. Shortly thereafter he left the College entirely.

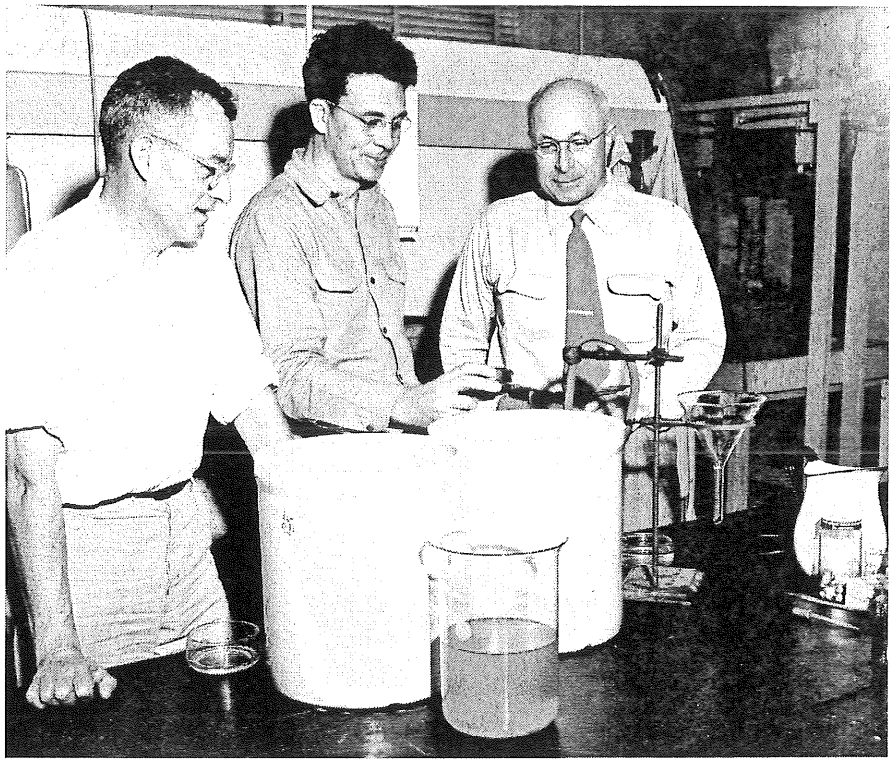
While Marshall was Laboratory director, research continued to focus on oysters, clams, crabs, shad, striped bass and oyster drills. Many of the same types of research that had begun during the Laboratory's first five to six years continued. Experimental research investigated pesticide control of oyster drills and effects on the blue crab of aerial spraying of DDT for mosquito control.

In his last full annual report Marshall recommended establishing a fisheries statistics program and an annual biological survey of public oyster rocks, developing new seed oyster areas, and continuing support for the Chesapeake Bay Institute, pointing out that CBI's hydrographic program had been planned as a long-term project, requiring at least five years to achieve results of consequence.

environmental science, under whose aegis marine science studies and research continued. Since 1975, graduate education at VIMS has been solely a program of William and Mary.

The graduate program in Marine Science has grown in prestige and stature since it began in 1940. In the early years relatively few people applied, were accepted or enrolled. As best as can be determined, as of 1959 fewer than 15 students had enrolled in the program, with 13 master's degrees awarded. By 1969, total enrollment had increased to 127, and a total of 47 M.A. and 3 Ph.D. degrees had been granted. During the next 10 years 211 new students enrolled and the number of degrees awarded totalled 93 master's and 47 doctorates. For the last decade of the first half-century, new enrollments were 168 and 117 M.A. degrees and 72 Ph.Ds were awarded. In that decade, the number of degrees awarded per year usually increased, despite decreased federal support and waning interest in science among American students.

A total of 275 master's degrees and 118 Ph.D.s have been granted since the program began. Of those, all of the doctorates and most of the master's degrees have been awarded since 1960. Some 95 percent of VIMS graduates are working in marine science fields, some of whom have been actively recruited by interested oceanographic, governmental and industrial concerns.



Drs. J.L. McHugh, third VFL director (1951-59), Jay D. Andrews, one of the Laboratory's early biologists, and Victor Loosanoff, Virginia's first trained marine scientist, 1954.

The majority of students over the years have been U.S. citizens, but the program is widely recognized internationally, and the number of student applications from foreign countries increases each year. For example, before 1980 only five foreign students, most from Asia, had graduated. Since 1980, 22 foreign students have earned degrees. Of foreign students enrolling in the program, Asians have dominated, with 11. Four students have come from Europe, four from South America, three from Turkey and two from Egypt. The country with the most students enrolling in the program has been mainland China, with five students as of June 1990.

Education for the Public Schools, the Public and Industry. The scope of the education program carried out at VIMS exceeds that of just undergraduate and graduate instruction: Since the beginning, the Institute has devoted programs to students in Virginia's public schools, the non-student public, and marine industry, and at least one scientific position has been devoted to the effort since 1940. Since the early '70s several people, including scientists, professional educators and assistants, have been involved.

Materials, programs and special courses in marine science and conservation have been developed specifically for public school teachers and students. Teaching aids—collections of marine organisms, films, special lectures and field trip opportunities—are provided regularly.

During the '60s, when the federal government was promoting science as a career and as oceanography became popular, the National Science Foundation funded training of high school and college teachers in research, and grants were available to give advanced high school and college undergraduate students marine research opportunities. Since then other special educational programs have been developed, such as those for the state's Governor's School and minority student encouragement projects.

Physical and Programmatic Growth

In February 1951 Dr. J.L. McHugh, a native of western Canada, assumed the directorship of the Virginia Fisheries Laboratory. McHugh, a fisheries scientist from the West Coast, brought a different perspective to the Laboratory. For example, the annual report for 1950 and the first part of 1951 contained summaries prepared by the scientists, not by the director (as Marshall had required).

In mollusk research oysters received the most attention, with studies of setting on shells planted in the Rappahannock. Extensive collaboration between the Laboratory, the Chesapeake Bay Institute and the U.S. Fish and Wildlife Service investigated the origin, distribution and setting of oyster larvae in the James. The work resulted in a careful exploration of the lower James' unique water properties, yielding new concepts of two-layered estuarine circulation and relationships between currents and the movement of oyster larvae. The resulting reports and papers have come to be regarded as classics in estuarine science. Controlled studies of oyster mortality in trays in the York River and oyster feeding experiments rounded out the oyster research.

The importance of the other fisheries and the health of the estuaries was evident in the Laboratory's research. Growth, reproduction and analysis of catches in Virginia's winter crab dredge fishery dominated blue crab research, and a new method of tagging crabs was tested. Finfish research emphasized the croaker and patterns of its distribution and abundance, identification of larvae, and morphometry. Shad research continued, and the finfish research program was expanded to include other fish in the Pamunkey River. A study was initiated in the Rappahannock River between Tappahannock and Fredericksburg to determine how industrial wastes, specifically those from Fredericksburg's American Viscose Corp., were affecting the river's "biological values," as indicated by finfish distribution and abundance. Population surveys of finfish became regular features of the research program.

Increasing attention was directed at oyster mortality, with growing emphasis on a "fungus" as the cause. Fish kills, and the possibility that estuarine pollution

was causing them, also excited interest. Laboratory specialists studied increasing destruction by tonging of James River seed oyster rocks, as well as the feasibility of a shrimp fishery in the Chesapeake Bay. Staff members were hired in response to the growing recreational fishery and to augment other research efforts, and the fisheries statistics program was again mentioned as a goal.

Laboratory administration and staff felt that management agencies were inattentive to their recommendations and began to withdraw from direct, personal advisory contacts. Emphasis shifted to written communications, both formal and informal.

Still an aquatic biology program within the College's department of biology, the graduate program continued to grow. Formal summer courses under a "consulting biologist" attracted graduate students and advanced undergraduates, and short courses in marine biology and fisheries were offered in 1951 and 1952 for graduate students in oceanography from Johns Hopkins.

More frequent attempts were made to acquaint the public, school children and teachers with the importance of the sea. In cooperation with the State Department of Education, the Laboratory offered a short course in fisheries research methods for vocational agriculture teachers in 1951, 1952 and 1953, reaching 2,500 students in about 60 elementary and high school classes. Many people visited the Laboratory's exhibits of marine life. The popular series "Watery Wonders" appeared in 12 installments in the Newport News *Daily Press*, and 15 television programs were produced, broadcast from one station in Norfolk and one in the Richmond area.

The General Assembly in 1952 reduced to one person each representation on the Laboratory's Board of Administration by the Commission of Fisheries and the College. Three representatives of industry were added, appointed by the governor, not the board. The Advisory Group, then also appointed by the governor, continued its activities, with 10 members representing the various regions and segments of the seafood industry.

During 1954 and early 1955 the scientific staff was increased by three scientists and a third consulting biologist. The roster of research assistants grew to include six graduate students. The Saltonstall-Kennedy Act of 1955 provided monies to the U.S. Fish and Wildlife Service to send two biologists from its Annapolis laboratory to study oyster drills in the York River. Two other federal employees investigated how processing practices affected oyster meat. Those cooperative interactions continued for several years. McHugh renewed efforts through the state Personnel Office to increase salaries in order to attract and hold competent scientific personnel and employed the Laboratory's first professional librarian.

Special research on sport fisheries was instituted and a survey of Lynnhaven Inlet and its tributaries conducted. Under a special contract from the State Highway Department, the Laboratory and CBI investigated the effects of dredge-and-fill work associated with construction of the Hampton Roads Bridge-Tunnel, now part of Interstate 64, connecting Hampton and Norfolk. The study was the first of a number of studies related to bridge, bridge-tunnel and highway construction programs in Tidewater Virginia.

During 1955 and 1956 plans were drawn up for a new research vessel, R/V *Pathfinder*, and the 7,618-square-foot "Annex," which provided classroom, office and laboratory space. R/V *Pathfinder* was completed in 1957. The Annex, later named Brooke Hall after Virginia's first marine geologist, John Mercer Brooke, opened in 1958. The Annex also provided dormitory space for graduate students, the first they had had in permanent Laboratory buildings since 1953 or so when their quarters in Maury Hall were made into library and research office space.

After arranging for the employment of a pollution specialist, McHugh resigned the directorship in early 1959 to join the U.S. Fish and Wildlife Service. He was replaced in February by native Virginian Dr. W.J. Hargis Jr., who served as acting director until May 1959, when he was appointed the fourth full-time director of the Virginia Fisheries Laboratory.

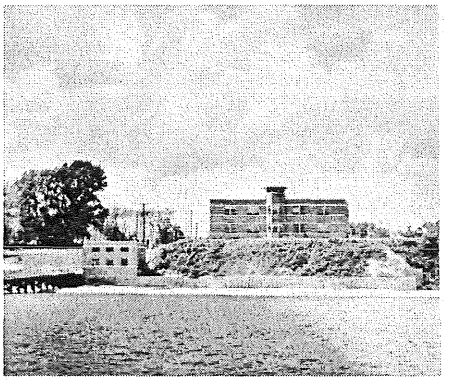
Specific effort has been devoted to reaching elementary-age students, on the theory, "the younger the better." The success of those programs has made public awareness of the importance of the marine environment and its resources greater than ever.

Maritime interests, such as the seafood industry, marine recreational industries, developers, landowners, vessel operators, and restaurateurs, have been reached through special workshops, talks, publications and advisories.

Educating the public has been addressed through media relations, public programs, such as exhibitions at the Virginia State Fair, open houses, and presentations and lectures for the public at the Institute and before civic groups. Special radio and television programs on marine-related topics have been produced and aired. And the Institute has prepared, bought or borrowed films and videotapes for presentation to interested groups.

In summary, the Institute's long-standing educational efforts have been continuous, deliberate and addressed to the entire age and interest spectrum of public and private groups. The Institute's efforts have significantly enhanced Virginians' awareness of the importance of the Chesapeake Bay system, the waters of the Atlantic Ocean, and the state's historical and present dependence on the resources, environments and amenities of our tidal waters. VIMS has educated, in Virginia and nationwide, citizens, maritime interests, and students alike in marine science and the conservation and wise use of marine resources. This education effort, which has contributed so much to the current widespread interest in Chesapeake Bay and the oceans, must be continued.

Maury Hall, the first building on the Gloucester Point campus, dedicated 1950.



Dr. William J. Hargis Jr., director from 1959 to 1981 and the first dean of the School of Marine Science of the College of William and Mary.

Advisory Services

In his early writings Donald W. Davis used the term "extension agent," envisioning a network of strategically situated and staffed satellite facilities to help Virginia's maritime interests, the seafood industry at first. Persuaded by arguments of the utility of marine science and of having a state-chartered and state-funded marine laboratory, the General Assembly approved expenditures of General Fund monies for marine science.

The other supporters of Virginia's marine science organization promoted and justified the program largely on utilitarian grounds. The earliest Acts of Assembly specifying duties for the laboratory were passed in 1944, among other things providing for a 10-person Advisory Group representing all maritime regions of the state. The members were to be knowledgeable about the seafood industries and maritime regions of Virginia and would interact with laboratory scientists, technical personnel and administrators. The Advisory Group (as well as the Board of Administration, also created by

Robert S. Bailey, Laboratory information director, on the set of WHRO-TV, Norfolk (late 1950s).

Focus on 'Green-Water' Oceanography

In 1957, 1958 and 1959 massive kills of oysters in Delaware Bay, believed to have been caused by a disease organism, brought concern that similar kills might occur in seaside waters of Virginia's Eastern Shore or even in the Chesapeake Bay. Hargis assumed duties with that possible catastrophe looming. Accordingly, emergency funds were sought and obtained from Gov. Lindsay Almond and the Special Session of the General Assembly in the late winter of 1959, and a pathology unit was established in the spring, as soon as the emergency funds became available.

The efforts of McHugh and the Board of Administration, augmented by Hargis' contacts with state executive offices and the General Assembly, resulted in increased appropriations in 1958 and 1959, and the staff was increased by a number of new scientists, including a special marine microtechnician.

Because there was concern that the oyster disease might spread southward from the lower Delaware Bay, a temporary laboratory was established at Wachapreague, on the sea side in the middle of Virginia's portion of the Eastern Shore.

Hargis, with W. Melville Jones, dean of the College, had been charged by President A.D. Chandler with evaluating the College's science and graduate education programs. The sciences at the College improved with the eventual addition of the department of geology and the strengthening of the staffs of the other science departments. Furthermore, and of more import to the Laboratory, the marine science program was removed from the department of biology as the Board of Visitors established a department of marine science. The master of arts degree, formerly awarded in aquatic biology, became the master of arts in marine science. Total enrollment increased markedly after the College's School of Marine Science, proposed by Hargis, was created in 1961.

A program was begun that offered high school teachers research training in marine science. So were two National Science Foundation-supported summer programs, "Research Participation for College Teachers" and "Undergraduate Marine Research Participation." The programs would continue for about 10 years.

Public education programs flourished. The conservation program for students and teachers attracted about 1,150 people annually. The Laboratory was

linked with its public audiences through educational bulletins, presentations and television appearances. Several films were produced, including "Fisheries Research," "Sampling at Sea," "Menhaden Schooling," "Jelly Fish" and "Crab Pot Research." The exhibit room in Maury Hall became more popular.

Advisory services, since the early '50s mostly confined to written communications and the annual report to the commissioner of fisheries, again began to emphasize direct contact with management agencies and industry. Hargis was determined that information and advice would be provided as the General Assembly had mandated, whether or not recipients requested the assistance.

Problems in the fisheries mounted with severe oyster mortalities in the lower Chesapeake Bay. The die-off began, not on the sea side of the Eastern Shore as had been feared, but in the heavily planted, high-salinity oyster beds of the lower Bay, lower York River and Mobjack Bay—more or less the places hit in the 1929-30 epidemic that had helped Donald Davis sell the marine science program initially. Private oyster farming and public harvesting quickly collapsed in the lower Chesapeake Bay as disease killed more and more oysters and private oystermen turned to "preventive" harvests—harvesting oysters earlier than they normally would have.

Awareness of pollution and growing difficulties in maritime industries provided further impetus for growth in marine science and engineering, nationwide and locally. Competition with the Soviet Union following the *Sputnik* surprise added to the pressure for growth in U.S. science. As the national oceanographic effort moved out of its post-war lag a number of new ocean research initiatives began. The growing national, regional and state pressures prompted a renewed focus on the sea, and Hargis was determined that Virginia would assume a significant role in that movement. His ambition was to make the Laboratory the dominant oceanographic research, service and education program in the mid-Atlantic states, if not the entire South. The Board of Administration agreed, seeking and receiving an increased appropriation from the General Assembly for the 1960-61 biennium.

To help fulfill that ambition, in 1961 Hargis requested a grant of more than $5 million from the National Science Foundation to build a major oceanographic vessel. The proposal, the largest the Laboratory had ever submitted, was turned down. From then on the Laboratory's focus was estuarine, coastal and continental shelf waters. Deep-ocean work was left largely to other institutions as the Laboratory moved toward becoming the nation's paramount shallow-water oceanographic organization.

In 1960-61 scientists and technicians were hired, providing strength in bacteriology, zoogeography, geology and physiology. Toxicity and radiobiological research capabilities were added. The Laboratory's ability to recruit and reward scientific talent improved when the Personnel Office in Richmond separated Laboratory personnel from the general state classification system that included "Aquatic Biologist" categories and established those of "Marine Scientist" and "Marine Laboratory Specialist." That change provided considerable independence from other professionals in the state classified system and facilitated salary increases. The staff grew rapidly.

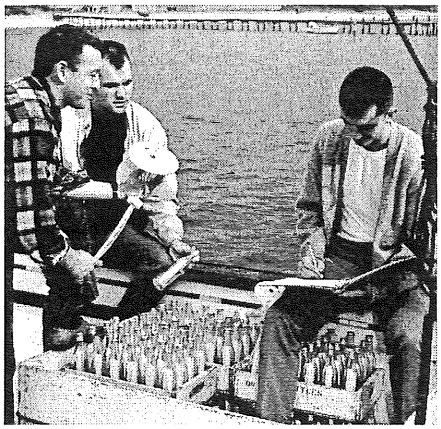
The Laboratory's focus on research in accessible reaches of coastal and continental shelf waters gathered momentum as R/V *Pathfinder* was dispatched offshore regularly. Increased use of federal vessels and those of the Woods Hole Oceanographic Institution added to the laboratory's oceanic capabilities. And from the National Aeronautics and Space Administration came surplus vessels, the Chincoteague-Wallops Island ferry that was converted into R/V *Langley*, and the space capsule tender, R/V *Retriever*.

A 3,868-square-foot microbiology building, named Davis Hall after Donald W. Davis, was constructed by Laboratory personnel using funds from the National Institutes of Health and the state. Adjacent land was acquired at Gloucester Point and Wachapreague, and the first permanent building (3,068 square feet) on the Wachapreague campus was completed in late 1961. A dormitory and other buildings were added later.

the General Assembly) was required to "advise" via annual reports. Scientific and educational interaction of the College and both groups were intended to foster a close advisory relationship.

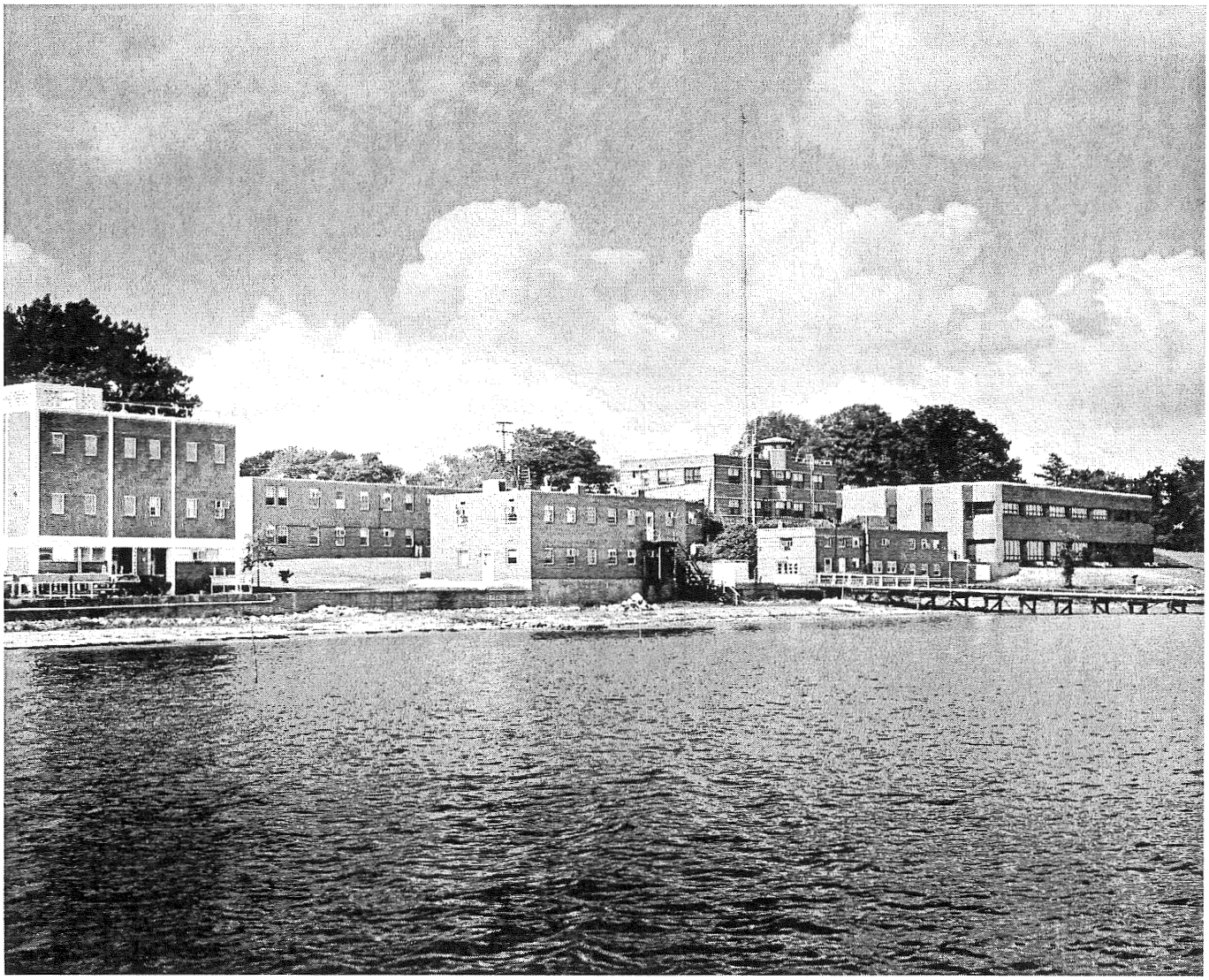
Since 1944, every legislative re-enactment and addition has reiterated and strengthened the Assembly's expectation of useful service to the health and welfare of the people and to posterity. Providing useful information and advice continue to be major tasks and responsibilities of the Institute. An assessment of the overall performance of the Institute must involve a careful examination of the record of service. How well has VIMS performed its service functions during its first half-century?

Over the years, advisory services have been actively pursued at the Institute, although the emphasis they have received has depended on the Institute's finances and the size of its staff. Advisory activity at VIMS has also been influenced by



Dr. Edwin Joseph and two graduate students prepare sea-bed drifters and drift bottles in a current study (early 1960s).

legislated federal funding programs, such as the Sea Grant College Program and the Coastal Zone Management Program, and state programs. Despite vagaries of funding and changing administrative priorities, the Institute has devoted major effort to providing practical assistance to its "customers." Its methods of communicating advice also have varied with the Institute's capabilities and the variable climate of the state and nation.



The Institute campus, 1985.

The Virginia Institute of Marine Science: An Experiment in Independence

In response to recommendations in a 1961 report by the "Title 28 Commission," (titled "Report of the Commission to Study and Revise Title 28 of the Code of Virginia Relating to Fish, Oysters, and Shellfish"), the General Assembly in 1962 changed the name of the Virginia Fisheries Laboratory to the Virginia Institute of Marine Science. Praised by the commissioners in their report, the Institute was established as an independent state institution with its own governor-appointed Board of Administration. Although the board continued to involve representatives of the College and ex officio members of the Commission of Fisheries, the chairman was a "civilian," a representative of the seafood industry. The board began to function as the boards of visitors of other Virginia colleges. The Institute's director was no longer a board member. Hargis was the last to serve in that capacity.

The Institute's annual reports were addressed directly to the governor and the General Assembly rather than via the commissioner of fisheries. In addition to recommending the name change, the Title 28 Commission, of which Hargis was a member, recommended that the Commonwealth, the Commission of Fisheries and the Institute pay more attention to Virginia's marshlands and wetlands; to the environmental consequences of engineering modifications of the Chesapeake Bay and its environs; to the resources and phenomena of the Virginian Sea (as Capt. John Smith called the mid-Atlantic Bight in his 1608 chart); and to the growing problems of pollution and water quality.

Advancement in the Institute's educational programs also was urged as the General Assembly added to VIMS' mandates the responsibility for conducting formal education in marine science. In response to pressures from Old Dominion University, the University of Virginia and the State Council of Higher Education, VIMS' educational programs were made available through all state-accredited colleges and universities, no longer just William and Mary.

The Title 28 Commission urged that new facilities, including an offshore research vessel and additional personnel, be provided for the Institute from the General Fund. The General Assembly provided all but the vessel, and VIMS was forced to look elsewhere for a vessel capable of operating for extended periods on the Atlantic Ocean.

During the ensuing 15 years the Institute continued to grow with additional state appropriations, and programs were created in accordance with a master plan. Land was annexed at the Wachapreague and Gloucester Point campuses. Byrd Hall, a three-story, 20,000-square-foot laboratory, classroom and office building, was dedicated in 1969 in honor of Adm. Richard Evelyn Byrd, Virginian and noted polar explorer. The pace of legislative and financial support for marine science, engineering and education increased.

Many of the Laboratory's research sections, established in 1960 and 1961, were given department status as new scientific and technical personnel joined the staff. Most noteworthy were the microbiology-pathobiology and the applied science departments. A department of physical and geological oceanography was established and its staff augmented. Several dozen scientific, technical and administrative positions were added, and the staff grew markedly. A cooperative study of currents and interactions between Bay and Atlantic waters was undertaken with the U.S. Navy and the U.S. Coast Guard.

The graduate program grew to 30 students as opportunities for financial support increased. Special educational programs, with NSF support, allowed research participation by selected college teachers and students, and public education efforts increased. The Conservation Council of Virginia offered a summer course for teachers in resource conservation and the environment, its marine-related portions taught by VIMS personnel.

Virginia Marine Science Modernizes

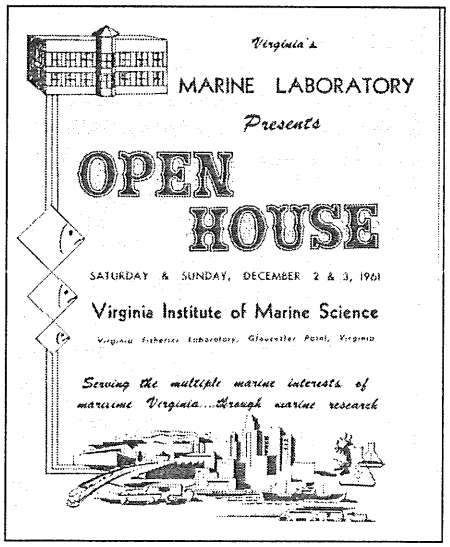
By the beginning of Hargis' second decade as Institute director, the Institute's long-term personnel roster and the organizational patterns for research, advisory services and education for its fourth decade had taken shape. Some of their features continue today. In 1970 the main programs were fisheries, biological oceanography, physical science and coastal engineering, and environmental science and engineering. The Institute's Special Programs and Scientific Services group comprised the Wachapreague laboratory, the library, information and education, advisory services (with the Insitute's Sea Grant projects), data processing and statistical services, and the Office of Special Programs. Chemical, physical and geological oceanography, by then separate, flourished.

Congressional action in 1966 resulted in establishment of a civilian study group, the National Commission on Marine Sciences and Engineering Resources—popularly called the Stratton Commission after its chairman. An oversight body in the executive branch, the National Council on Marine Research and Engineering Development, was established in the office of the vice president. Several VIMS personnel appeared before and worked with subcommittees of the

As the program's service portion evolved, advisory communications were made via formal mechanisms (VIMS' official Advisory Services group, Advisory Reports, Advisory Letters, Advisory Appearances and Testimony). Informal individual advice also was provided by VIMS administrators and scientific specialists when specific demand or opportunity for advice arose.

Each year or biennium, Virginia Fisheries Laboratory reports were communicated, as parts of the official reports of the commissioner of the Virginia Fisheries Commission, to the Commission (later named the Virginia Marine Resources Commission), the College's Board of Visitors, and the governor, state executive agencies and the General Assembly. Special written reports also came out of direct contacts of the Laboratory director and other personnel with government and business.

As is the rule with academic institutions, results of the Institute's research are made widely available through publication in scientific journals. However, more immediately useful to management and granting agencies are special reports and other advisories based on research results. VIMS' "SRAMSOE" reports (Special Reports in Applied Marine Science and Ocean Engineering), Special Scientific Reports (SSRs), Data Reports, Marine Advisory Services and Information Booklets, have been useful to local, state and regional agencies, and even national entities. Many groups, including the General Assembly and Congress and their committees have preferred and requested specific written reports and special oral testimony.



Soon after Hargis became Laboratory director a vigorous, even more formal communications method was developed. Laboratory representatives were named official advisers to the Virginia Fisheries Commission, the Virginia State Water Control Board, and the Virginia Department of Health, to the General Assembly, and to industry. The representatives communicated with their assigned agencies by visits or indirectly, with telephone calls, letters and reports. Special studies, either requested or volunteered, were also conducted and the results communicated, usually by reports, letters or testimony.

The representatives were expected to appear at all relevant official (and unofficial) meetings of the agencies, and at relevant regular and special committees of the General Assembly. As a result, they sometimes appeared uninvited at crucial or controversial meetings. The Institute's unrequested attention on rare occasions made its recipients unhappy, yet it was considered a requirement of the Code of Virginia.

The Institute's formal Advisory Services arm evolved during the '70s under joint sponsorship of VIMS and Sea Grant, and other scientists, engineers and specialists still acted in an advisory capacity, serving state executive and legislative, local, regional, and some national entities.

Advisory service is a required, recognized activity of the Institute: Both legislative history and specific provisions of the Code of Virginia make the task of providing advisory services, information and assistance the Institute's primary responsibility. Little has happened to the marine resources and environments of Virginia and the region, including the Virginian Sea, in which the Institute, its specialists and its Advisory Services have not participated. VIMS has covered the waterfront, literally and figuratively.

Stratton Commission, and the director served as a consultant to the National Council. In those capacities, VIMS personnel served as advisers on estuarine and coastal resources and environment. The Institute's organization, programs and accomplishments were widely regarded as models in the national trend that saw the focus of oceanography and ocean engineering move from the deep oceans to include more activity in the coastal waters.

VIMS' activities and reputation extended into the international realm as its scientists served as advisers to the U.S. State Department in fisheries negotiations with the governments of the Soviet Union and Poland and as assistance was given international treaty organizations. President Richard M. Nixon appointed Hargis vice chairman of the new National Advisory Committee on Oceans and Atmosphere. NACOA oversaw the nation's oceanic and atmospheric programs and advised the president, the relevant executive agencies and Congress. President Gerald Ford later appointed Hargis NACOA chairman.

During that period VIMS scientists and administrators were active in molding and promoting a number of national programs, including the federally legislated National Ocean Program, National Sea Grant Program and National Coastal Zone Management Program, the Jellyfish Act, and several fisheries research programs.

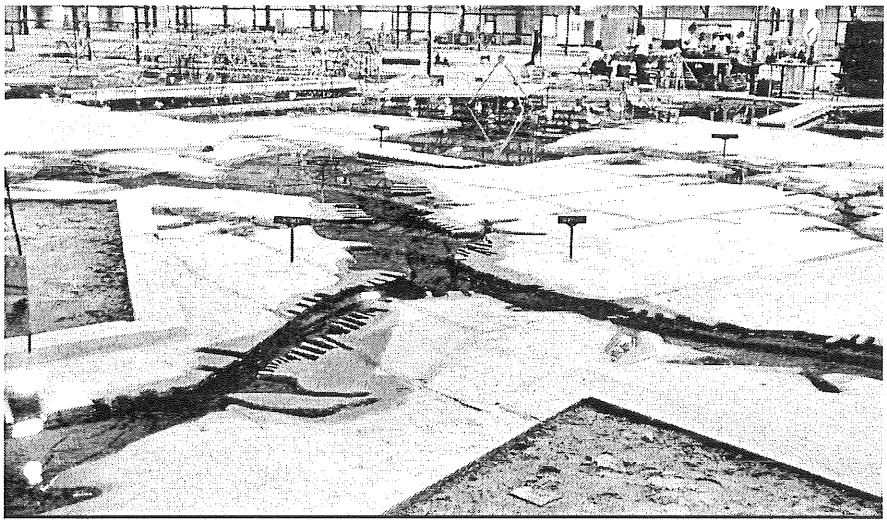
Stratton Commission recommendations focused attention on the resources and environments of shelf, coastal and estuarine areas, and a number of national initiatives resulted. The Institute was exceptionally well situated to participate in and capitalize on the programs, including the National Coastal Zone Management Program and the Bureau of Land Management's offshore oil and gas development activity. The Institute would receive sizeable contracts from both.

Both the Stratton Commission and the National Council focused attention on the Chesapeake Bay as a system in increasing trouble and urged heightened awareness and attention to its problems. With a 30-year history of research, education and management-related activity in the Chesapeake, the Institute was in the vanguard of that effort.

Its personnel had been active in establishing the Chesapeake Research Council, comprising VIMS, the Chesapeake Biological Laboratory and the Chesapeake Bay Institute. They had worked with the Corps of Engineers and the National Oceanic and Atmospheric Administration on their Bay programs and were instrumental in the founding, organization and operations of the Chesapeake Research Consortium Inc., comprising the University of Maryland, Johns Hopkins, the Smithsonian Institution and VIMS. They also cooperated extensively with the Chesapeake Biological Laboratory, the Chesapeake Bay Institute, the Interstate Commission on the Potomac River Basin, the Potomac River Fisheries Commission, and state and federal management agencies. VIMS was in an especially favorable position to participate in the Chesapeake Bay thrust.

Public interest in the resources and environments of the sea and its margins grew during the '70s. The focus on oceanic, coastal and estuarine waters and the shorelines continued at national and state levels. Consequent growth in the Institute's staff, programs, projects and facilities quickened during the early and middle years of its fourth decade.

Financial support from the General Fund increased, but as the decade progressed, an ever greater proportion of the Institute's funding was derived from grants and contracts. By 1978, when the staff reached its largest size at almost 600, outside sources provided more than 70 percent of the Institute's research revenues. The new monies came in the form of large contracts from the Bureau of Land Management, the Sea Grant Program, the Coastal Zone Management Program and others. The list of federal agencies providing financial assistance for research grew to include not only the traditional fisheries-support organizations but also the U.S. Department of Defense, NIH and NSF. Numerous small grants added to the financial strength, as did private sources, as businesses provided grants and contracts and donors contributed boats and other usable or saleable property. For example, VIMS acquired two large vessels, R/V *Virginia Belle* and R/V *Second Heaven*, from a Virginia businessman.



The James River Hydraulic Model, Vicksburg, Miss.

The research fleet grew. The Navy again arranged to transfer surplus vessels (later christened the R/V *Virginian Sea* and the R/V *Tern*), vehicles and other equipment from the federal inventory. An aircraft, a DeHavilland Beaver, was provided as well. New buildings were bought and built. The Franklin Marine Center (including the small boat basin, several buildings, vessel operations and housing for physical oceanography) was assembled, and additional land was purchased. By 1978 VIMS building space at Gloucester Point and Wachapreague totalled 115,000 square feet, and land area was approximately 37 acres.

The Institute came of age in capability as a field and laboratory center for marine research and training. For example, electron microscopy developed further, the James River Hydraulic Model at Vicksburg, Miss., built earlier by the Army Corps of Engineers and Virginia, continued operations as part of the Institute, and in VIMS' hydraulics laboratory a new flume and a wave tank were built for experimental oceanography and engineering.

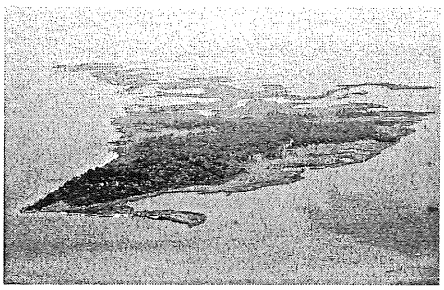
The massive quantities of biological, chemical, geological, physical and engineering data required enhanced data-handling and computing capabilities. The Institute developed MERRMS—the Marine Environment and Resources Research and Management System. MERRMS provided storage, rapid recall and graphic presentation of large quantities of information, much the same as in a military "war room." Plans had been drawn up for expansion of the system, but MERRMS, was abandoned. NOAA has since used the concept to develop the risk assessment program operated by its Strategic Assessment Branch.

Advisory Services received great emphasis in the 1970s. Institute scientists, administrators and special advisers provided consultation to Virginia industries and businesses—not just the seafood industry but transportation, development, recreation, tourism: all segments of the state's maritime economy. Ready and direct advice was provided regularly to the relevant state management agencies (Virginia Marine Resources Commission, State Health Department, State Water Control Board, Soil and Water Conservation and others), the governor's office and the General Assembly. Regional and national services were also provided to the Potomac River Fisheries Commission and various federal agencies. From time to time, Institute positions on environmental issues, such as the Kepone problem and the placement of oil refineries, were somewhat unpopular with certain state executive officers and other proponents of industry. Although not unexpected, ensuing charges and counter-charges became heated at times. The Institute was doing its job.

Graduate programs offered specialization in many fields of marine science, engineering and marine affairs, including economics, management and resource law. Enrollment increased, as did the number of graduates. Total enrollment reached 117 in the 1979-80 academic year. Public education programs continued, with special instruction to high school and undergraduate students.

VIMS was a prime mover in the development and passage of the Virginia Wetlands Act of 1972, not only urging legislative action but actually laying the groundwork for and drafting the legislation. (It gained a reputation for it. When residents of the Eastern Shore stiffened resistance to the wetlands bill, some called it the "VIMS" or "Hargis" bill.) The Institute was instrumental in the acquisition of several Eastern Shore barrier islands by the Nature Conservancy to preserve their sensitive ecosystems. The salvation of the Goodwin Islands and similar sites from ill-conceived development was also a solid advisory contribution.

The Islands were donated to the Endowment Association of The College of William and Mary in Virginia Inc. with VIMS as the manager of the site. Their action was particularly significant in that it later gave the Institute and the Commonwealth the ability to compete for the establishment of a National Estuarine Research Reserve in Virginia. Designation of Reserve sites is underway.



The Goodwin Islands.

Hard clam aquaculture is successful internationally largely as a result of research by Mike Castagna, based at VIMS' Wachapreague laboratory.

VIMS fisheries scientists have participated in management proposals or studies for almost every saltwater fishery on the East Coast, through the Potomac River Fisheries Commission, Atlantic States Marine Fisheries Commission, Mid-Atlantic Fisheries Management Council, International Commission on North Atlantic Fisheries, International Council for Exploration of the Sea and various special committees. The Institute also has been a leader in establishing hard clam aquaculture and efforts to restore striped bass stocks. Major contributions have been made in improving pollution control by the 3-C James River Projects, the Small River Basin Projects and the Kepone Project.

A list of public and private organizations served by the Institute over the years would be too long to publish in this history. Were it presented, however, it would include all Virginia executive agencies whose missions are related to the marine or estuarine environment or resources; interstate and intrastate organizations; and congressional committees and study groups. The list also would include the offices of the president and vice president of the

Renewed Ties with William and Mary

In 1979, funding expenditures from outside sources reached almost $5 million in a total budget of $9.2 million. Soon thereafter, however, the federal government reduced its funding of the types of research and engineering services that the Institute was providing, which increased competition for the monies that were available. The Institute's grant and contract revenues diminished, followed by reductions in professional, technical and support staff. The administrative staff grew in attempts to master increasing accounting difficulties.

By 1977-78, that VIMS should continue as a "separate state-supported institution" had come under question. Efforts were begun by the Institute director to renew administrative and supervisory affiliations with The College of William and Mary, with whom VIMS had enjoyed its longest-lasting and strongest ties. Gov. John N. Dalton, a William and Mary alumnus, agreed with the movement, as did the General Assembly, which again made the administration and fiscal matters of the Institute the responsibility of the College's Board of Visitors. VIMS' Board of Administration was disbanded. The challenge was accepted immediately as considerable institutional effort was directed toward the transition and financial stability.

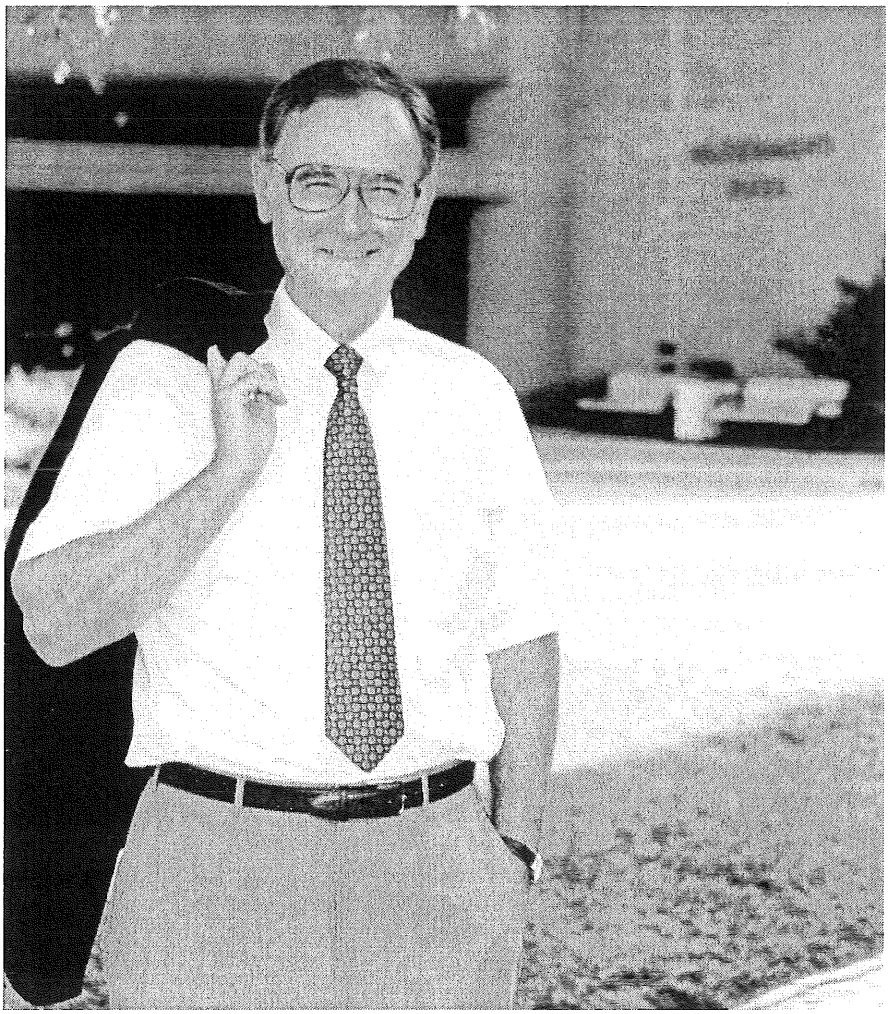
Despite waning federal support, the major programs of the Institute continued with only minor changes, and several new initiatives were undertaken. The budget decreased from $9.2 million in fiscal year 1979-80 to $8.2 million in fiscal year 1983-84 but thereafter increased steadily to its 1989-90 level of $17.5 million. Many of the new programs were associated with the developing interstate, state and federal Chesapeake Bay research program, including studies of toxic organic chemicals and of inorganic nutrients, of diminishing submerged aquatic vegetation, and of threatened tidal marsh systems and subtidal wetlands. Surveys, monitoring and research continued on the species that supported major commercial and recreational fisheries.

In Advisory Services, the frequency of contacts with shoreline management agencies increased. Regular and special meetings with local wetlands boards, state agencies, the U.S. Fish and Wildlife Service and the Corps of Engineers kept VIMS' wetlands specialists busy. The Institute published dune protection guidelines in July 1980, developed with the Virginia Marine Resources Commission under Virginia's Coastal Primary Sand Dune Protection Act. The series of publications by the Tidal Marsh Inventory Program has proved valuable in managing the state's wetlands. The pesticide Kepone, toxic metals and the effects of oil spilled in an East Coast estuary were studied, and a third proposed crossing for Hampton Roads was studied by use of mathematical modeling. NOAA granted the Institute Sea Grant Institutional status in 1979-80, and VIMS received one of seven International Sea Grant Projects.

The graduate programs of the School of Marine Science continued to gather strength. The public education program involved continuing press releases, special lectures, seminars and programs given to students of Virginia high schools, community colleges and civic organizations. Wetlands workshops were prepared and presented to local wetlands boards. Specialists at the Eastern Shore Laboratory provided hands-on courses in growing hard clams.

In 1981 Hargis resigned after 22 years as VIMS director and 20 years as dean of the College's School of Marine Science. By then, plans for completing the integration into the College had been developed through work with Rector Edward R. Brickell, Visitor Herbert V. Kelly, President Thomas A. Graves Jr., Vice President George R. Healy, and other key College administrators. By 1982, VIMS' governor-appointed Advisory Group had been phased out and the administrative integration of VIMS into the College was complete.

The only differences between VIMS and most other units of the College were that VIMS' specific legislative mandates still provided its mission and that its budget remained separate line items in the Appropriation Acts. Essentially Donald W. Davis' dream of a state-supported, College-operated marine research, service and educational institution—a full-fledged academic marine laboratory—had finally come to pass 65 years after he first actively and publicly began to urge its establishment.



Dr. Frank O. Perkins, dean and director since 1981.

The Fifth Decade

Dr. Frank O. Perkins, a native Virginian with the Institute since 1966, was made acting director of VIMS and acting dean of the School of Marine Science in May 1981. The following May he was appointed to those posts permanently. Integration into the College's academic framework was pursued actively. Additional VIMS scientists received tenured or tenure-track faculty status and were placed under annual contracts, affording them for the first time the opportunities and protection of full faculty status. Equally important, their salaries were freed from the limits imposed by the state's salary scale for classified employees, resolving a 25-year struggle begun by the Laboratory's second director, Nelson Marshall.

As federal support for non-defense-related marine science decreased and as competition for that support increased, VIMS' grant and contract support diminished. However, public attention was drawn to the threatened health and future of the Chesapeake Bay. Virginia's official commitment to those problems was evidenced by its signing of the intergovernmental Chesapeake Bay Agreement in 1983. VIMS would continue its lead in Chesapeake Bay research. Thanks to the increased political influence provided by the College, its Board of Visitors and alumni; to Perkins' vigorous efforts; and to the financial freedom offered by the improving state economy, General Fund support of the Institute increased.

In fiscal year 1979-80, of the Institute's total expenditures, $5 million, or 54 percent, was supported by state appropriations. By 1984-85, state support had increased to $8.1 million (77 percent of the total) and by 1989 to $12.3 million (70 percent), even after a one-percent budget cut by the state. For the research budget, the relative levels of "hard money" (state funding) and "soft money" (outside support) had been reversed. In fact, the Institute enjoys probably the best

United States, the State Department, NSF, ONR, the Oceanographer of the Navy, the Corps of Engineers, NIH, NMFS, NOAA, the U.S. Fish and Wildlife Service, and the Minerals Management Service.

VIMS has worked closely with all Virginia district planning commissions whose work is related to the tidal waters, and probably with all cities, communities and counties bordering the state's tidal waters—as well the government of Maryland and several communities and industries there. Often, special interdisciplinary study groups were formed between the Institute and other institutions to handle specific projects or problems.

VIMS administrators and scientists have provided consultation, review, oversight and advisory services at regional, national and international levels, and in fields extending beyond ocean science. Arenas in which they have contributed include resource use, environmental management, and socio-economics, areas in which VIMS must, by law, work, areas that make contributions to society and posterity.

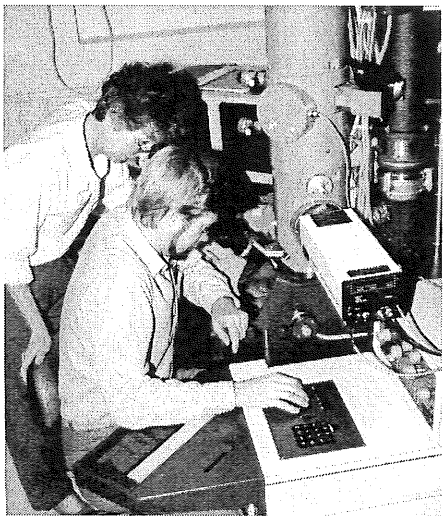
The Institute probably has been the major non-commercial provider of marine advisory services in Virginia since 1959, and it has done well at it. If the General Assembly's mandates are to be followed, Advisory Services must continue to be a major function of the Institute. Without it VIMS will not fulfill the most important function expected by the people of the Commonwealth, as expressed by their elected representatives, nor will it be following the Code of Virginia.

VIMS' computer room allows students and staff access via terminals to the Institute's PRIME mainframe.

A Look Ahead

The programs of the Virginia Institute of Marine Science and its predecessors have made a difference in the resource and environmental management efforts of the state, region and nation. Almost nothing of significance has happened to the resources and environments and their uses, users and amenities that has not been studied and affected by VIMS personnel and programs.

Public awareness has been enhanced by a 50-year-old public education program. Graduates of The College of William and Mary's School of Marine Science and the University of Virginia's Department of Marine Science occupy significant positions in management, academia and business.



Nita Walker and Wolfgang Vogelbein use the Institute's new transmission electron microscope, acquired in 1988.

The Institute's research and advisory efforts found solutions and partial solutions. They have also revealed other problems. The wetlands and shoreline research and management programs have met with perhaps the greatest success. Many of the Commonwealth's major problems, such as overfishing, overcrowding, increasing environmental pollution, destruction of wildlife habitats, and ineffective control of solid wastes, have not been solved, but all have been ameliorated.

hard-money-to-soft-money ratio of any state-supported marine laboratory in the United States. Improved financial management and position has added greatly to VIMS' financial stability and well-being. That, coupled with improved salaries for faculty, provided stability for the scientific staff and increased ability to recruit competent scientific personnel. The program was able to stabilize and grow significantly despite reductions in federal support.

Perkins' desire to increase private funding for the Institute led to the establishment in 1982 of the VIMS Founders Society, which includes donors to the Institute of $1,000 or more. The Founders Society was formulated by Norfolk businessman George W. Roper II and brought into being as a result of his vigorous support. In 1983 the first organized full-time development program at the Institute began with the hiring of A.H. Humphreys Jr. as development officer. The effort has been successful: Private donations have totalled $2.6 million between July 1982 and June 1990. With boosts from the College's development effort and alumni, gifts now support endowments, fellowships, professorships and programs. The future of privately funded activities appears bright.

In 1982 Perkins, also with Roper's leadership, formed the Marine Science Development Council, an advisory group of about 20 members representing various maritime and other business interests, a move that has helped steer the development of plans, programs and support at VIMS. The Institute owes much to Roper for his positive innovations and vigorous support of the Institute's activities. As a result, his efforts will be significant in the coming years of the 1990s and beyond.

State and private contributions have helped VIMS improve and acquire more field and laboratory equipment. The Institute has taken advantage of modern computers for increased capabilities in management, word processing, publishing, graphics, data storage and retrieval, data analysis, image processing, and mathematical modeling. A central PRIME computer system replaced a key-punch-based system in the early '80s, providing individual terminals for staff for the first time. The PRIME is still used widely and provides the main storage area for the Institute's data. Yet many people also use personal computers, which are becoming increasingly interconnected in networks. Several research vessels are computer-equipped, and many of the analytical instruments are computerized, providing researchers with analyzed results almost as fast as the instruments can record data. In fact, demand for computer capability has grown to such a level that the capacity of VIMS' central computer system will have to be increased markedly.

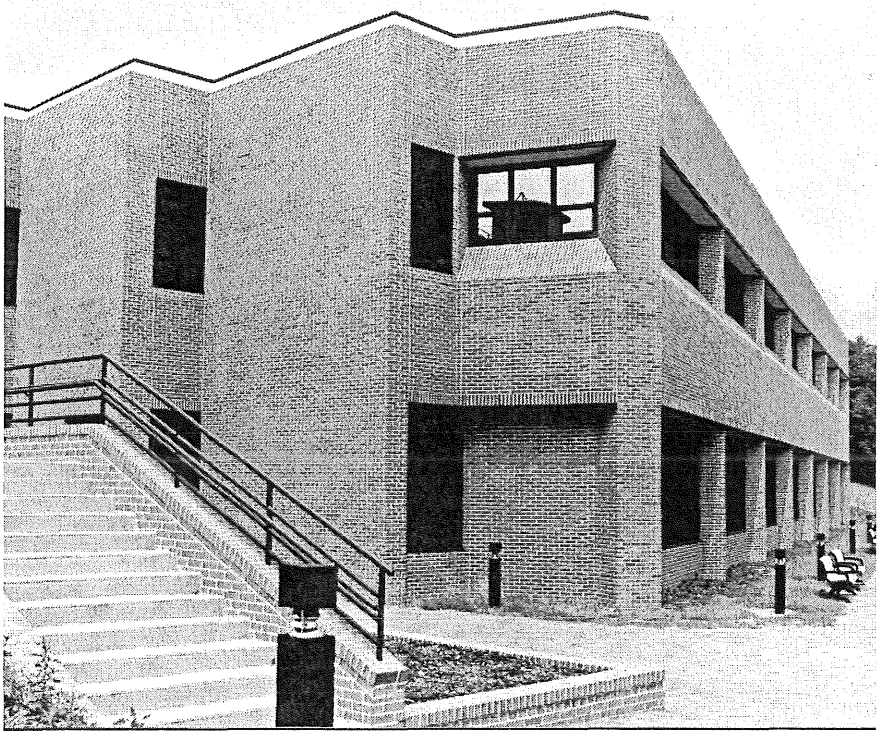
Perkins reorganized the Institute in the early '80s to reduce the number of administrative units and provide for stronger interaction between physical and biological scientists. General areas of research and programs changed little. Commercially and socially important species or groups of species received considerable attention from the fisheries units. Toxicologists, immunologists and geneticists studied the effects of environmental contaminants—especially pesticides, polynuclear aromatic hydrocarbons and tributyltin. A continuing program investigates the effects of pollution and focuses on the highly contaminated Elizabeth River system. A strengthened toxicology-pathology thrust has emerged, supported by a specifically dedicated portion of the General Fund.

As the Chesapeake Bay program has evolved, its focus has changed somewhat. Early attention to low dissolved oxygen, nutrient enrichment and submerged aquatic vegetation is shifting now to the effects of toxicants on the health of the Bay and its biota. Studies of wetlands and shorelines has prospered in response to national, regional and state priorities. After a period of absence, Virginia formally joined the National Coastal Zone Management Program under Gov. Charles Robb, and VIMS' coastal activities gathered force.

The Endangered Species Act and the Marine Mammals Act focused attention on the several species of sea turtles that appear in Virginia's tidal waters and to local and transient porpoises and whales. That popular and highly visible work has attracted much public attention for the Institute and marine science.

Oyster mortalities, periodically worsened by severe droughts, have received much attention, as have efforts at oyster culture aimed at restoring the disease-damaged fishery. The decades-old work on the circulation, biology and chemistry of the lower James River have been strengthened as studies of oyster seed production have been renewed. Studies of local estuaries and coastal environments were given impetus by development projects, such as the proposed Newport Island project, and by increasing burdens of sewage and solid waste disposal fueled by population and commercial growth.

Formal educational programs continue, and the student body promises to grow even further. The office of dean of graduate studies has been established at the Institute with Dr. Henry Aceto Jr. as its first acting dean. Considerable discussion is in progress regarding the level of faculty participation in the administration of the School and the design of the graduate education program.



Watermen's Hall, dedicated in 1984.

There is no single reason that some of the Institute's research and advisory efforts have only been partly successful. Decision-makers often do not act effectively on the scientific information and advice they receive. Many resource and environmental problems are so complex that complete answers are not available, despite more than 50 years of research. And the problems are so numerous, massive, complex and dynamic that effective, timely solutions are difficult to develop. The worst problem is the continuing rapid, uncontrolled growth of the human population around the Chesapeake (and elsewhere on the coast) and the destruction caused by our increasing demands on the coastal zone. This has created new problems and worsened existing ones even as they were under study.

Despite warnings and some tentative efforts, it seems that society cannot cope with population growth, destructive development, solid waste, overfishing, energy waste, and misuse of resources and the environment. Acquiring scientific information and then persuading managers and the public to use it effectively is like rowing a boat upstream at three knots against a five-knot current. We have made some progress in solving the problems of our marine resources and environment. Yet with the lethargic pace at which governments try to solve resource and environmental problems, it seems that society is destined not to catch up, get ahead or win.

Despite such dismaying prospects, however, science cannot stop. The Virginia Institute of Marine Science and its counterparts must strengthen their abilities of data gathering, analysis, prediction and application. State, regional, federal and international resource and environmental management programs must improve. The rate of socioeconomically driven environmental destruction must slacken.

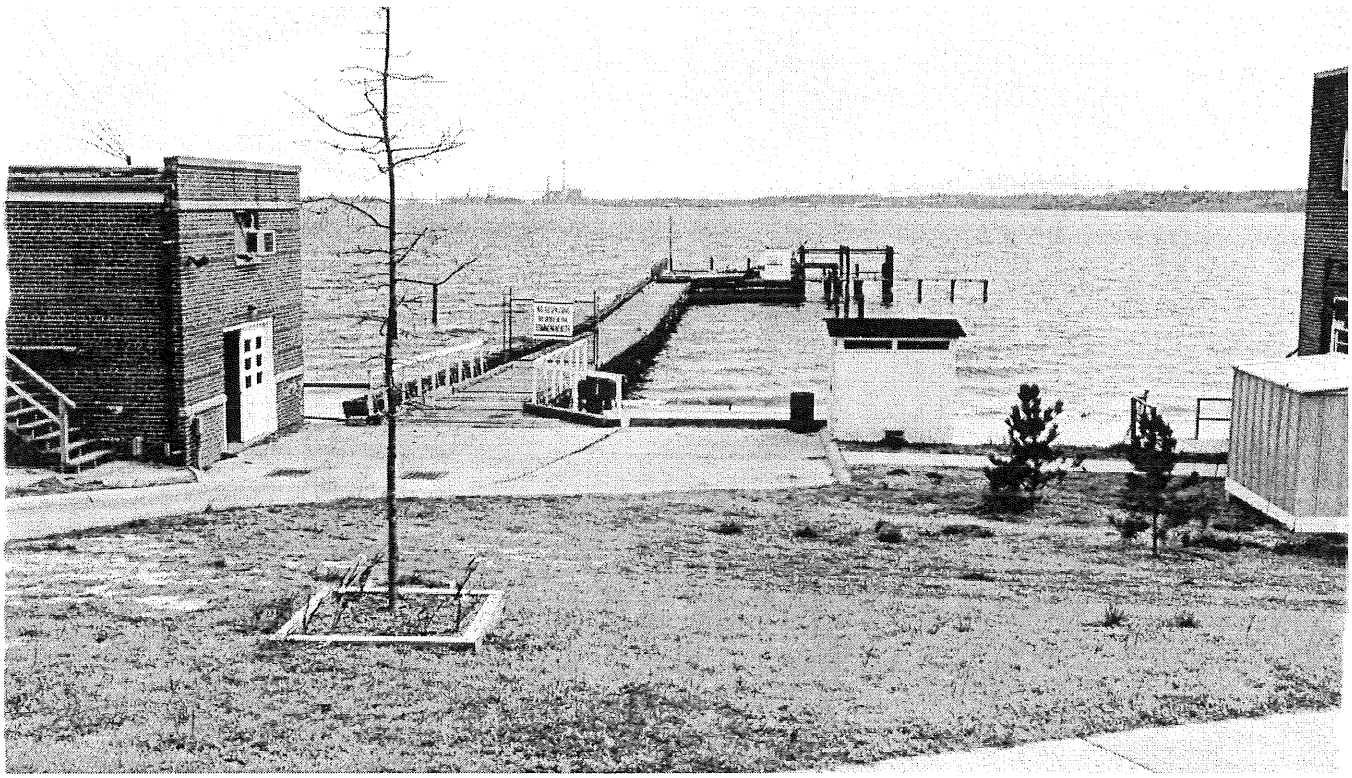
Society must expect VIMS and organizations like it to help stem the tide. During its first half-century, VIMS has made a great deal of progress in its ability to provide such help. Perhaps the next 50 years will see marine science and technology provide society with the information and tools to bring its resource and environmental problems under control. Perhaps society will learn to use those tools effectively. We all must hope so.

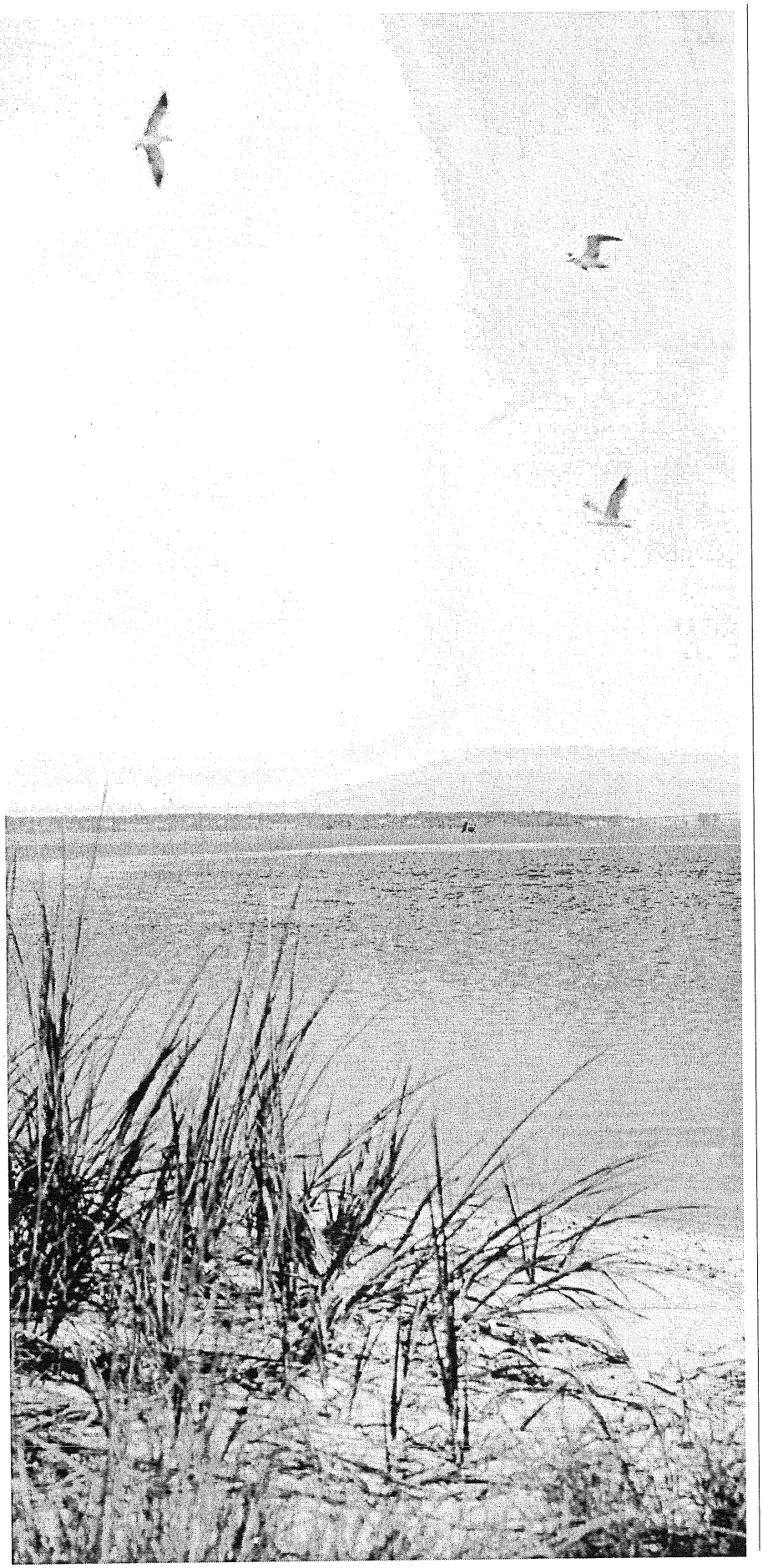
Renewed attention is being paid to working with the College's School of Education to add marine science subjects to a combined curriculum. That demonstrates the interest developing in expanding the activities of the School of Marine Science into other areas of graduate education. The possibility of again offering special summer courses in marine science and allied fields for graduate and advanced undergraduates is encouraging, as is that of developing undergraduate courses in marine science at William and Mary's main campus.

Public education has received a boost from the new VIMS Aquarium and exhibit room in Watermen's Hall, the Institute's largest permanent building, which was dedicated in 1984. The Aquarium attracts many casual visitors, as well as participants in organized field trips for schools and other groups. The number of special school visitation programs has also increased in connection with the Chesapeake Bay awareness initiatives, and the services of VIMS speakers continue in high demand.

On balance, the '80s were kind to the Institute. Financial operations stabilized and then markedly improved, with increased General Fund support, which is more regular and reliable than the uncertain grant and contract funding. That result of the Institute's return to William and Mary is one of the greatest improvements of the period. Substantial increases in private support also improved VIMS' financial position. Capital outlays also increased, allowing construction of new administrative, academic, laboratory and research facilities, including Watermen's Hall. Long-planned land acquisitions have consolidated its property holdings at Gloucester Point. And outside grant and contract support has, once again, begun to increase—a very encouraging sign.

When the solid accomplishments of the past 10 years are added to those of the first 40, the Institute has clearly made much progress. It has, through the efforts and the making and seizing of opportunity by its administrators and staff, attained significance within the state educational and research system, as well as regionally, nationally and internationally. With its annual budget of almost $18 million, the Institute is the largest academic research institute focusing on estuarine and coastal environments.





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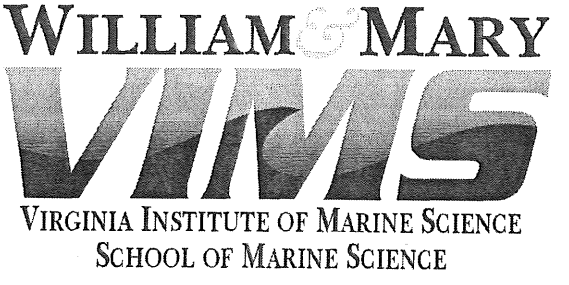
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